A Theoretical and Empirical Analysis of Structured Finance

por

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Dissertação de Doutoramento em Ciências Empresariais – Área de Especialização em Finanças

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2013

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To Francisco and Filipa

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to all those who have kindly contributed to this dissertation.

First and foremost, I am grateful to my supervisors, Professor Manual de Oliveira Marques and Professor William Megginson, who encouraged my interest in selecting this dissertation topic and whose knowledge and guidance were essential. To Professor Manuel de Oliveira Marques, I am profoundly grateful for your belief in this dissertation topic and for your encouragement, invaluable guidance, and support.

During this project, I received a number of useful suggestions and comments from a wide range of people. I would like to acknowledge the help provided by Paulo Alves, Pedro Duarte Silva, Ricardo Cruz, Ricardo Cunha, and Vitor Nascimento for the time they willing gave me and for listening attentively, discussing ideas and making suggestions, all of which greatly improved the contents of this dissertation. Additionally, I am grateful to João Cabral dos Santos and Gordon Roberts for the very useful comments offered at the 2011 Financial Management Association Doctoral Student Consortium.

I would also like to extend my sincere thanks to Brian Maia-Tanner and to Jorge Alcover for their helpful suggestions and for sharing their vast experience in the area of structured finance. Their contributions were very useful and beneficial for this piece of research.

A special word of appreciation is due to Goldman Sachs for providing me with access to DCM Analytics database and to the Catholic University of Portugal, Porto for providing me with access to Dealscan database.

I would like to thank Filipa, my wife and companion for life, who never failed to encourage and support me throughout this PhD program, which undoubtedly was a long and demanding journey for her as well.

Finally, I would like to thank my parents and my sister for their interest, love and support.

RESUMO

Na presente dissertação efetua-se uma análise teórica e empírica dos financiamentos estruturados. Apresentam-se as suas principais características, motivações, benefícios e problemas, e procede-se à comparação desta tipologia de financiamento com os financiamentos tradicionais ou não estruturados.

A análise empírica desenvolvida tem por base uma amostra composta por operações de financiamento estruturado e de financiamento não estruturado, desenvolvidas na Europa Ocidental entre 1 de Janeiro de 2000 e 31 de Dezembro de 2011. A amostra de financiamentos estruturados é composta por 2.859 empréstimos realizados no âmbito de operações de *project finance* e 599 obrigações emitidas através da titularização de ativos. A amostra de financiamentos não estruturados é composta por 20.977 empréstimos obrigacionistas. Procede-se, então, às seguintes análises: (1) como é que os fatores explicativos do custo do financiamento comparam entre financiamentos estruturados e não estruturados; (2) será o *spread* significativamente diferente nas duas formas de financiamento; (3) em que medida são os *spreads* destas duas tipologias de financiamento determinados pelos mesmos fatores; (4) será que a crise financeira internacional afeta de forma diferenciada os *spreads* destes financiamentos; e (5) quais os fatores que determinam a escolha entre estas duas tipologias de financiamento.

Tendo subjacente a análise estatística realizada conclui-se que a maior parte dos fatores explicativos do *spread* são significativamente diferentes entre financiamentos estruturados e não estruturados e que o *spread* é estatística e significativamente maior para operações de *project finance* do que para operações de titularização de ativos e empréstimos obrigacionistas. Já a análise de regressão implementada demonstra que financiamentos estruturados e não estruturados são instrumentos de financiamento distintos. Tal como esperado, o *spread* é estatisticamente e significativamente mais elevado para o período de crise financeira. No que respeita à relação entre *spread* e maturidade conclui-se que existe uma relação não linear – do tipo '*hump-shaped*' – para *project finance* e uma relação linear e positiva para empréstimos obrigacionistas. Finalmente, conclui-se que os promotores escolhem operações de financiamento estruturado quando procuram financiamento a longo prazo e que a probabilidade de observação de uma operação de financiamento estruturado diminuiu com a crise financeira de 2007/2008.

ABSTRACT

This dissertation examines, at both the theoretical and empirical level, what structured finance transactions are, the motivations behind them, their benefits, features and even their problems, and confront them with their basic alternative, that is, straight debt finance. We argue that structured finance reduces the all-in cost of financing by minimizing the net costs associated with market imperfections or inefficiencies.

This dissertation provides a full-length empirical analysis of structured finance, comparing the financial characteristics of a large sample of Western European structured finance transactions – 2,859 project finance loans and 599 asset securitization bonds – with a sample of straight debt finance transactions – 20,977 corporate bonds –, issued in the international capital markets between January 1st, 2000 and December 31st, 2011. We examine (1) how common pricing factors compare between structured finance and straight debt finance transactions; (2) if the credit spread of structured finance transactions is significantly different to the credit spread of straight debt finance transactions; (3) the extent to which are structured finance and straight debt finance transactions priced by common factors; (4) if the credit spread of structured finance transactions is significantly affected by the 2007/2008 financial crisis; and (5) what factors determine a manager’s choice between these financing alternatives.

We find that most of the common pricing characteristics differ significantly between structured finance and straight debt finance issues and that average credit spreads are statistically and significantly higher for project finance loans than they are for asset securitization bonds and corporate bonds. Loan and bond pricing regression analyses reveal that structured finance and straight debt finance transactions are distinct financial instruments and thus funded in segmented capital markets. According to expectations, the financial crisis does have a significant impact on structured finance and straight debt finance credit spreads; i.e., the average credit spread is statistically and significantly higher during the crisis period. We find a robust hump-shaped relationship between credit spread and maturity for project finance loans and a linear positive relationship between credit spread and maturity for corporate bond issues. Finally, when we apply an organizational choice model, we point out that borrowers choose an structured finance transaction when they seek long-term financing and the 2007/2008 financial crisis decreases the probability of observing an asset securitization transaction.

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1. Introduction

"*The increasing complexity of the structured finance market, and the ever growing range of products being made available to investors, invariably create challenges in terms of efficient assembly, management and dissemination of information.*"

Andreas Jobst (2006a)

The global development of the corporate sector has been demanding the creation of new vehicles for fundraising. Professionalization and the growing sophistication of capital markets, as well as increasing access to international markets, require less risky securities and internationally standardized warrantees.[1] Therefore, analysis has been increasingly focused on a risk assessment process based on asset segregation and asset pooling, rather than on a company or a group of companies looking for financing. For many countries, this has required adjustments to be made to their financial system, towards new forms of financing, in which the role of structured finance transactions has gained increasing relevance.

Defining the boundaries of structured finance is not an easy task at all. In fact, neither in academic nor in professional literature can systematic studies be found dealing with the positioning of both researchers and economic agents in the market (financial intermediaries). Similarly, there is little discussion of structured finance in leading corporate finance textbooks.[2] Additionally, structured finance has been a large and rapidly growing subfield of finance, yet one where academic theory and research lag along way behind current practice. Given the growing importance of structured finance as a new financing instrument, corporate executives, bankers, lawyers, investors, government officials, and academics need to understand what structured finance is, why and how it may create value, and how to structure transactions with both operational and financial success. Research is needed not only to explain some practical paths, but

[1] Throughout this dissertation we use the terms security, financing instrument, and financial asset interchangeably.

[2] As argued by Caselli and Gatti (2005), "*In actual fact, neither in national or international literature can systematic studies be found which deal with both positioning of actors on the market as well as the choice of organizational structures at the basis of services offered.*" Leland (2007) presents the same idea pointing out that "*[Y]et financial theory has made little headway in explaining structured finance.*"

also to refine and re-direct existing finance theories. This was the first and primary motivation for the present study.

The interest of studying structured finance is also justified by its dramatic increase in the last decade and by recent events in financial markets. The financial turmoil started in the third quarter of 2007 and continued through to 2008, leading to concerns about the exposure of financial institutions to the most risky segments of the US mortgage markets – the so-called subprime mortgage market – and related financial instruments. The resulting financial market tensions caused investors and regulators to be concerned about (and even doubt) the impact of some types of structured finance transactions on financial stability during times of stress, and the ability of different structured finance products to spread shocks across different capital segments.[3] As a result, there is an increased need to understand what structured finance transactions are, the motivations behind them, their benefits, features and even their problems.

Thirdly, although the academic literature analyzing the credit spread of corporate bonds is vast and growing, research on structured finance bonds and loans credit spread is scant. Empirical studies on project finance and asset securitization price determinants are very limited, although some exist. However, a comparative empirical investigation of the price determinants of project finance, asset securitization and corporate bonds is something completely new.

Finally, even though the financial crisis is not the focus of our work, the suggested link between structured finance and the turmoil of the financial markets makes the analysis of the determinants of choosing a structured finance transaction *versus* a straight debt finance transaction particularly interesting and indeed relevant, both theoretically and practically.

The evidence presented provides a more accurate framework for the objectives of this dissertation. In fact, this dissertation aims at the following six purposes. First, it contributes to a systematic definition of structured finance, by identifying its main

[3] The tumult in credit markets since 2007, which was related to problems involving securitizations of U.S. subprime mortgages and the widespread use of off-balance sheet vehicles, which rapidly spread to the global financial system, has called into question the desirability of structured finance. As referred by Lupica (2009), "*Technological innovation coupled with financial wizardry fueled the rapid growth of the securitization market, leading to increasingly high volume conversions of cash flows into complex securitized and collateralized debt instruments and their derivatives.*"

characteristics and critical success factors. Second, it examines the economic advantages which can result for originators / sponsors from each type of structured finance transaction, i.e., why structured finance matters? We make use of finance literature relating to security design, financial innovation, and structured finance to identify economic forces underlying the creation of structured finance transactions or products. Third, it compares the credit spread and the common pricing factors between and among structured finance and straight debt finance transactions. Fourth, it provides insights into the impact of the 2007/2008 financial crisis and the subsequent European sovereign debt crisis on structured finance credit spreads (and even on straight debt finance credit spreads). Following this, it identifies the common pricing factors for various types of structured finance transactions (asset securitization bonds and project finance loans) and measures the capability of each one to explain the credit spread. Econometric analyses are performed of the determinants of loan and bond pricing for structured finance and straight debt finance transactions (corporate bonds). Finally, it determines the factors that influence the choice of a structured finance transaction instead of a straight debt transaction.

Considering that structured finance instruments are financial products designed to meet different needs of borrowers and investors as closely as possible, we start (Chapter 2) by discussing security design theory and its relationship to the literature on financial innovation and structured finance. Our aim is to put into perspective some of the fundamental motivations of firms to select structured finance *versus* straight debt finance transactions. Although all security design models provide a number of important insightful predictions, firms’ financial and financing structure decisions still remain unsatisfactorily explained, mainly (i) in terms of structured finance transactions, and (ii) with respect to the reason why firms decide to use structured finance as opposed to common debt. One possible explanation is that existing security design theories do not simultaneously and dynamically endogenize all contractual features.

A key feature of structured finance transactions, which differentiates them from other financing arrangements, is the presence of a separate vehicle company (SPV or SPE) incorporated to take the initiative and to secure cash receipts and the resulting payments.[4] Based on the literature review, as well as on the evidence emerging from the practices of international and domestic intermediaries that compete in the structured finance business area, we propose the following definition of structured finance:

> *Structured finance refers to the design of financial products or instruments based on the use of flexible tools to meet, as closely as possible, the requirements of the originator or owner of an asset (or pool of assets) and the needs of investors. Thus, structured finance encompasses all financial arrangements helping to efficiently (re)finance a specified pool of assets beyond the scope of on-balance sheet financing products or instruments.*

Bearing in mind the aforementioned definition, as well as the available academic and professional literature, we consider that asset securitization, project finance, structured lease and leveraged corporate acquisition activities (mostly leveraged buyouts – LBOs), are all different forms of structured finance.

To understand why structured finance matters, we are taken back to the Modigliani and Miller (1958) capital structure irrelevance theorem,[5] which holds that capital structure is irrelevant to firm value.[6] In a Modigliani and Miller world, structured finance transactions would not exist, as they would offer no advantages over less costly alternatives. However, considering that debt and equity of any firm effectively represent asset-backed securities, the irrelevance proposition can play a fundamental role within a structured finance framework. In a world of perfect and liquid financial markets, where asymmetric information is not an issue, tranching[7] or the act of encapsulating an initiative or a pool of assets in an *ad hoc* organization would not add value and firm's

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[4] Caselli and Gatti (2005) point out that the use of *ad hoc* vehicles (SPVs – special purpose vehicles, or SPEs – special purpose entities) which encapsulate projects or a pool of assets is a typical feature of structured finance transactions.

[5] Modigliani and Miller presented formal proof that – under frictionless, perfect, and competitive capital markets – the value of a firm is independent of its capital structure; therefore its market value is unaffected by its financing choices. Their pioneering work, which showed the implications of market equilibrium conditions for firm structure and valuation, remains one of the most robust and influential contributions to modern finance theory.

[6] Academics use the Modigliani and Miller theorem as a framework to consider which of its assumptions might be violated for particular capital structures; i.e., which real world costs a particular capital structure may help to reduce. As pointed out by Esty (2004a), their irrelevance proposition "*... is powerful because it highlights the factors that make financing and structuring decisions value relevant.*"

[7] Tranching means the creation of multiple types of securities backed by the firm's (or by the underlying asset pool, when considering securitization) assets and is considered one of the most important features that distinguishes structured finance instruments from traditional products (or straight debt finance instruments).

financing structure would be irrelevant. Thus, the existence of market imperfections (at least asymmetric information, market incompleteness, and market segmentation) can explain tranching, 'off-balance sheet financing' and the benefits of structured finance instruments. Consequently, structured financing may matter, because it creates value by minimizing the net costs associated with the stated market imperfections.

Several economic motivations for assembling a financing transaction under a structured form are presented below. First, it enables the financing of a unique asset class that (i) previously may have been financed only by traditional borrowing methods or (ii) could not be financed at all without structured finance. Structured finance thus plays a critical role as a new and diverse source of funding. The second economic benefit lies in cost reduction, when the benefits of the reduced cost of funding are greater than the cost of the required credit enhancement. The third advantage refers to maintaining the sponsors' financial flexibility by creating vehicle companies (SPVs) designated to take on the initiative, helping sponsors to protect their own credit standing and future access to financial markets, by improving or maintaining financial and regulatory ratios. Additionally, structured finance transactions allow originators or sponsors to transfer the risk of assets or liabilities and to carry out additional business without expanding their balance sheet. Structured finance also contributes to improving operational and informational market efficiency, reducing agency costs, and reducing information asymmetries. Finally, it also allows the issuer to obtain more leverage, compared to senior unsecured debt, and to increase tax shields/savings.

Despite the previously mentioned economic benefits for sponsors and investors, structured finance transactions also have disadvantages, especially when used inappropriately. One can identify the following problems related to the use of structured finance transactions: (1) complexity; (2) off-balance sheet treatment; (3) asymmetric information problems; (4) agency problems; (5) higher transaction costs; and (6) wealth expropriation. Besides the fact that structured finance instruments are complex *vis-a-vis* straight debt finance transactions or products, two major problems are commonly pointed out, underlying the roots of the 2007/2008 financial crisis: (i) asymmetric information problems; and (ii) agency problems. The increased complexity of structured products related to securitization – like CDOs, squared CDOs, and even more complex securities – destroyed information, thereby making asymmetric information worse in the financial system and increasing the severity of adverse selection and moral hazard problems. The originate-to-distribute business model, which lay behind the subprime mortgage market, was subject to the principal-agent problem, because (i) the mortgage originator had little incentive to make sure that the mortgage was of good credit risk, (ii) commercial and investment banks had weak incentives to ensure that the ultimate holders of the securities would be duly paid for, and (iii) even the credit rating agencies evaluating these securities were themselves also subjected to conflict of interest.

To our knowledge, no full-scale empirical study of structured finance in Western Europe has yet been published, namely studying the impact of the 2007/2008 crisis and the subsequent European sovereign debt crisis, on the credit spreads of loans and bonds. Despite its use on a worldwide basis and several decades of history, a number of key issues regarding the specific risk determinants of structured finance, *vis-a-vis* straight debt finance, remain largely unresolved. In particular, recent research has suggested that project finance (a class of structured finance transactions) loans might be fundamentally different from other syndicated loans and bond issues.[8] This dissertation aims at identifying the specific risk drivers and risk mitigants of structured finance transactions by means of comparative econometric analysis of *ex ante* credit spreads for a large cross section sample of Western Europe loans (project finance loans) and bond issues (asset securitization and corporate bonds), between January 1st, 2000 and December 31st, 2011.

Generally speaking, debt capital markets are roughly composed of two major types of financial instruments: straight debt finance (SDF) and structured finance (SF) instruments. Due to the differences in the structure and warranties related to these two types of transactions, their relevant pricing factors should also differ. This finding raises three questions: (1) *How common pricing factors compare between SF and SDF transactions (or tranches)*? (2) *Is the credit spread on SF transactions (or tranches) significantly different to the credit spread on SDF transactions (or tranches)*? And (3) *to what extent are SF and SDF transactions (or tranches) priced by common factors*?

[8] See Kleimeier and Megginson (2000), Hainz and Kleimeier (2003), and Sorge and Gadanecz (2008).

These questions lead us to test three hypotheses. First (Hypothesis 1 and Hypothesis 2) we intend to argue that not only the credit spread but even the common pricing factors differ significantly between SF and SDF transactions. The third hypothesis states that the primary market credit spreads associated with SF and SDF transactions are influenced differently by common pricing factors. In testing Hypotheses 1 and 2, we use a parametric test (*Student's t-test*) for continuous variables and a non-parametric test (*Fisher's exact test*) for dummy variables, to compare whether the distribution of the reported values for SF and SDF tranches are significantly different. In testing Hypothesis 3, we start by determining if SF and SDF transactions are priced in the same way, this is equivalent to testing whether project finance (PF), asset securitization (AS), and corporate bond (CB) issues are priced in segmented or integrated capital markets. Thus, a structural change test is used – we use the Chow test to determine whether the coefficients in a regression model are equal in separate sub-samples [Chow (1960)]. After documenting the extent to which the pricing variables for SF and SDF transactions show significant differences, we continue our empirical analysis by examining the factors impacting on the pricing of loans and bonds separately. We use an ordinary least squares regression analysis to model the magnitude of the relationships between pricing variables and the credit spread, and confront them with the outlined expectations.

Additionally, the 2007/2008 financial crisis played a significant role in the failure of numerous businesses, declines in consumer wealth, and a downturn in economic activity, contributing to the European sovereign debt crisis. This fact raises one final question: *Is the credit spread on SF transactions (or tranches) significantly affected by the 2007/2008 financial crisis*?

We thus propose to test a fourth hypothesis with the aim of studying the impact of the global financial crisis and the subsequent European sovereign debt crisis on structured finance credit spreads and pricing factors in Western European countries. We therefore examine whether the credit spread changes across time, by considering a pre-crisis period from January 1st, 2000 through to September 14th, 2008, and a crisis period from September 15th, 2008 (Lehman Brothers' bankruptcy filing date) through to December 31st, 2011. We use a non-parametric test (Wilcoxon *z*-test for continuous variables and

Fisher's exact test for dummy variables) to compare whether the values reported for each variable are significantly different in the two periods.

We study the specific characteristics of SF transactions by means of a comparative statistical and econometric analysis of credit spreads for a large cross section of Western European loans and bonds between January 1st, 2000 and December 31st, 2011. Our 'full sample' contains information about 599 asset securitization issues (worth Euro 179.1 billion) and 20,977 corporate bond issues (worth Euro 5,786.5 billion), extracted from DCM Analytics (provided by Dealogic), and 2,859 project finance tranches (worth Euro 332.1 billion), extracted from DealScan (provided by Thomson Reuters LPC).

The relative pricing of SF (PF and AS issues) *versus* SDF (CB issues) issues is one of the most important findings presented in our univariate analysis (Chapter 4). Average credit spreads are statistically and significantly higher for PF loans (198.3 bps) than they are for AS bonds (148.9 bps) and CB (157.6 bps). On the contrary, average credit spreads for AS and CB issues do not differ significantly. Therefore, we only accept the hypothesis that the credit spread on SF is lower than or equal to the credit spread on SDF for AS issues (Hypothesis 2).

We reject Hypothesis 1, as most of the common pricing characteristics differ significantly, not only between SF and SDF issues but also among SF transactions – all pair-wise comparisons indicate statistically significant differences in value, with the exception of credit spread, tranche size, and currency risk between AS and CB issues.

We find that the financial crisis does have a significant impact on SF and SDF credit spreads and we thus reject Hypothesis 4. The evidence strongly supports the assumption that the average credit spread is statistically and significantly higher for PF loans (329.1 bps *versus* 136.9 bps), AS bonds (206.5 bps *versus* 143.5 bps), and CB (220.3 bps *versus* 125.5) during the crisis period. We also find that the 2007/2008 financial crisis and the subsequent European sovereign debt crisis have a substantial impact on the common pricing factors of loan and bond tranches. Almost all of the pair-wise comparisons indicate that equality of means can be rejected for PF, AS, and CB issues. We corroborate these finding in our regression analysis, after controlling for other microeconomic and macroeconomic pricing factors; i.e., the coefficient for crisis dummy variable in PF, AS, and CB models is significantly, positively related to credit spread. Even when implementing an OLS regression analysis for our two sub-periods (pre-crisis and crisis period), we find that our results are robust across time, since the 2007/2008 financial crisis and the subsequent European sovereign debt crisis significantly influences the explanatory power of the regressions, as well as the coefficients on the macro and micro pricing factors. One of our most interesting findings is that splitting our PF loans sample has a considerable impact on the regressions intercept, causing an increase of 342.96 bps between pre-crisis and crisis sub-samples.

We conclude that, with respect to credit spread, PF, AS, and CB issues are not priced in a single integrated market. We thus reject hypothesis 3 and conclude that SF and SDF transactions are distinct financial instruments, and even PF loans and AS bonds are financial instruments influenced differently by common pricing factors. Rejecting Hypothesis 3 also means that we cannot estimate the full sample of loans and bonds in a single regression. So, we examine the determinants of credit spreads for each type of issue (PF vs AS vs CB) using an OLS regression framework. Although some variable coefficients have the expected features, others are not in line with the theoretical and the empirical literature. For example, even though currency risk coefficients for AS and CB issues have the expected features, our findings for PF loans are different from those presented in the empirical literature [e.g., Kleimeier and Megginson (2000)] – currency risk dummy variable has a positive impact on the credit spread.

Given the controversy in the literature regarding the term structure of credit spreads for speculative-grade issuers and even the empirical puzzle of the term structure of PF loans, we also analyze the term structure of credit spreads for SF transactions compared to SDF transactions (Chapter 5). We identify several economic rationales that might explain why we should expect a different shape for the term structure of credit spreads for SF *vis-a-vis* SDF transactions. The literature reviewed led us to verify the hypothesis of a hump-shaped term structure of credit spreads for PF loans, a positive relationship for CB, and a negative relationship for AS bonds. We thus analyze the pricing of our cross section sample of loans and bonds within a multivariate regression framework, augmenting our baseline multiple regression with the natural logarithm of maturity, while controlling for other micro and macro pricing factors. For PF loans, a robust hump-shaped relationship between credit spread and maturity is found. The logarithmic term is insignificant for AS bonds and a linear positive relationship between credit spread and maturity remains strongly significant for CB issues.

In Chapter 6, one final question is raised concerning the choice between SF and SDF transactions and even between PF loans and AS bonds, or between AS and CB issues: *What factors determine a manager's choice between these financing alternatives?* We want to determine what affects the probability of a new borrower's choice between SF and SDF transactions and even between a PF loan and an AS bond or between an AS bond and a CB. Therefore, we resort to a generalized Tobit model, following Heckman (1979). We perform maximum likelihood estimations of our credit spread samples for our model specification (models [1a], [1b], and [1c]), simultaneously with a probit selection equation where the probability of signing a loan or bond is a function of either micro and macro variables. We start our analysis by looking at the estimation of the determination equation in model [1d], it is probably the first time credit spread is regressed against micro and macro variables for a sample that simultaneously includes PF loans and AS bonds. We point out, for example, that the effect of lower tranche size increases the probability of selecting an SF transaction, rather than an SDF transaction. Borrowers chose an SF transaction when they seek long-term financing and when they operate in a higher risk country. Borrowers/issuers in industrial, utilities, transportation and government areas increase the likelihood of an SF transaction, more specifically a PF transaction. The probability of observing an AS bond issue increases if the borrower belongs to the financial industry. The 2007/2008 financial crisis decreases the probability of observing an AS transaction. Several macroeconomic factors, like the level of the interest rates, market volatility, the slope of the Euro swap curve, and credit accessibility positively influence the probability of observing an SF loan or bond. Finally, the market volatility, the slope of the Euro swap curve, and credit accessibility have proven to be irrelevant in the process of making a financing decision between PF loans and AS bonds.

This dissertation contributes to the available literature in several ways. First, to the best of our knowledge, this is the first work studying how common pricing factors compare between structured finance and straight debt finance transactions. Although the academic literature analyzing the credit spread of corporate bonds is vast and growing, research on structured finance bonds and loans credit spread is scant. Empirical studies on project finance loans and asset securitization bonds price determinants are very limited, although some exist. However, a comparative empirical investigation of the price determinants for PF, AS, and CB is something completely new. This gap in the literature is attributable to a lack of reliable data concerning the structure of asset securitization transactions. In this study, we overcome this problem by simultaneously using two databases (DealScan and DCM Analytics).

Second, the present work adds new insights to the banking literature on loan pricing. By concluding that the existence of substantial differences among and between SF and SDF transactions in the impact of common pricing variables on credit spread, we can state that these transactions are priced differently. The investment banks in charge of structuring the technical features of certain PF and AS issues may find the estimates a useful tool concerning the size of each variable's impact on the issuance credit spread and how they compare to SDF transactions, mainly after the 2007/2008 financial crisis.

Third, we contribute to the literature available on financial crises. The 2007/2008 financial crisis and the subsequent European sovereign debt crisis significantly influences the explanatory power of the regressions, as well as the coefficients of the macro and micro pricing factors (in sign and in significance). Thus, some important conclusions are presented regarding regulatory policies and their impact on the prevention of future crises. Additionally, SF transactions still remain a valuable means to respond to the demand for funding. AS techniques remain very useful for banks, for fund raising and to comply with regulatory capital requirements. From our regression analyses, we can also conclude that, in SDF lending, the borrower typically specifies the amount of debt they are seeking, and their creditworthiness becomes the main determinant of loan spreads. By contrast, when an SF transaction is arranged by investment banks, the goal is to come up with the most efficient mix of maturities, spreads, tranches, warrantees, and other credit enhancement mechanisms to manage what lenders perceive to be the risk and the probability of default on the debt. This means that for SF transactions, mainly in AS issues, credit rating becomes the most important pricing factor for this asset class when launched. Our findings are in line with those of Fender and Mitchell (2005), who argue that the increasing complexity of structured finance products creates incentives to rely more heavily on ratings than for other financing instruments, which is usually presented as one of the principal shortcomings of AS with regard to the 2007/2008 financial crisis.

Fourth, the present work points to the need to rethink the way banking regulation treats PF loans. Considering that we find a hump-shaped relationship between credit spread and maturity, a linear maturity adjustment to capital requirements (credit risk is usually viewed as increasing with maturity) might be less applicable to PF loans. Hence, regulatory capital arbitrage could induce banks to concentrate their loan portfolio on short-term *vis-a-vis* long-term project finance transactions, which might not be necessarily safer.

Finally, we offer contributions to the field of corporate finance, by improving the understanding of what the boundaries of firms are and new insights on the industrial organization economics. The nature of the firm as a nexus of contracts is even more apparent in SF than in SDF settings. In PF and AS, a specially incorporated new firm (SPV) is created to manage all contracts and to make cash flows more readily verifiable for lenders. In such cases, it is crucial to design financial contracts with the objective of pre-committing, whenever possible, the possible behavior of the SPV management. Careful contract design prevents agency problems between SPV sponsoring firms and lenders, and establishes an effective risk management framework. Pre-committing future obligations also reduces the volatility of cash flows available for debt service.

This document is organized as follows: Chapter 1 offers an introduction to the structured finance framework. It also identifies the motivations of our research, the objectives of the study, as well as its contributions. Chapter 2 presents a discussion of security design theory in the context of financial innovation, and in particular the design of structured finance securities or products. Chapter 3 addresses a review of structured finance related literature, based on the central economic benefits, as well as on the major problems related to the use of these financing instruments. Considering that structured finance, more specifically asset securitization, played a relevant role in the development and propagation of the 2007/2008 financial crisis, we dedicate a specific section to this issue. Chapter 4 details the research questions and presents the methodology. It also describes the Dealscan and DCM Analytics databases used in this study. In Chapter 4, the financial characteristics of SF tranches are compared with the sample of SDF tranches. We also study the impact of the financial crisis on credit spreads and pricing factors. Chapter 5 reviews the most prominent papers on loan pricing literature. It also examines the extent to which SF and SDF transactions are priced by common factors. It begins by presenting the methodology and discussing the sets of micro and macro variables and their expected impact on the credit spread. Next, it presents the regression analyses results. Our organization choice models are discussed and applied in Chapter 6. Chapter 7 includes a summary, our final conclusions, and some avenues for future research.

2. Security Design and Structured Finance

2.1. Introduction

"*Financial securities are designed to suit many motives. Entrepreneurs and firms hope to raise capital efficiently. The managers of a firm use the securities they issue on behalf of their firm to signal the firm's potential value and opportunities, or their own abilities and efforts. Entrepreneurs may issue securities designed to maintain some of the benefits of control of their firms. Market intermediaries hope to profit from offering transactions services in previously unavailable contingent claims. Regulators consider the role of financial innovation in promoting an efficient allocation of risk and capital.*"

Duffie and Rahi (1995)

The primary purpose of this chapter is to discuss the essential building blocks shaping security design theory, as well as the connection to the related literature on financial innovation and structured finance. It is important to invoke security design in the context of structured finance because, as mentioned by Cherubini and Della Lunga (2007), the development of a structured finance product "*... involves individuation of a business idea and the design of the product...*"

The literature on security design and financial innovation is extensive. A complete review of it is beyond the scope of this work.[9] Instead, this chapter reviews the most prominent papers and attempts to interweave them in a manner providing a consistent picture of the security design theory and its relevance to the financial innovation process. Structured finance products are commonly mentioned as one group of the newly introduced instruments from financial innovation activities.[10]

This chapter has five sections. The first section introduces the main purposes of this chapter. Section two looks into the relationships between financing activities and the

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[9] In order to refer to useful surveys on both theoretical and empirical literature in relation to security design, see among others, Harris and Raviv (1989), Allen (1989), and Allen and Winton (1995). Finnerty (1992), Allen and Gale (1994), Carow et al. (1999), and Fabozzi (2005) have a number of enlightening surveys on financial innovation literature, both theoretical and empirical. Duffie and Rahi (1995) also offer a sound survey about financial innovations and security design.

[10] The literature that relates to the issues of structured finance is discussed in Chapter 3.

theory of corporate finance. The third section provides a perspective on the security design problem, focusing on the design of optimal financial contracts. Section four examines financial innovation and security design. Section five outlines the implications of financial innovation in designing structured securities and products.

2.2. Financing in the Context of Corporate Finance Theory

"*New financial product design, improved computer and telecommunications technology, and advances in the theory of finance have lead to dramatic and rapid changes in the structure of global financial markets and institutions*."

Robert Merton (1995)

According to Arrow (1974), to acquire physical capital, which is essential for the fulfillment of the productive function, the firm must find successful ways of attracting financial capital. This idea is consistent with the standard economic theory, which defines a firm as a set of investment opportunities, from which some are selected. By the same token, Milgrom and Roberts (1992) pointed out that "*... the questions to be studied concern which investments ought to be undertaken, how the funds needed to pay for the investments ought to be raised.*"

Unfortunately, the neoclassical theoretical perspective of the firm fails to account for some important aspects of a firm's financial behavior in the real world.[11] Hart (1995) identifies three central weaknesses of the neoclassical paradigm: (i) its unawareness of the firm's incentive problems; (ii) its omission of organizational issues; and (iii) the absence of a credible explanation for firm boundaries. The explanation of the financial behavior of real-world firms demands a more robust framework.[12]

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[11] According to the neoclassical paradigm, the firm is viewed as a single economic agent whose actions follow specific and pre-determined decision-making criteria. Jensen (1983) posits that the neoclassical theoretical perspective views the firm as a production function in which "*... there are no 'people' problems or information problems,* […] *as a result the research based on this model has no implications for how organizations are structured or how they function internally*." Gavish and Kalay (1983) provides a similar view observing that "*... the firm has been viewed as a black 'black box', namely, as one homogeneous unit whose clear objective is to maximize its market value.*"

[12] We may observe firms from a diverse range of theoretical perspectives, such as: a production function; a nexus of contracts; an investment vehicle; a trade-off between the costs of transacting and the costs of contracting; and agency theory.

An alternative paradigm is the so-called contractual theories of the firm. These theories share a common contractual base and emphasize the importance of property rights (and therefore incentives), asymmetric information, and some behavior assumptions which extend the usual self-interest assumptions (such as 'opportunism' or 'moral hazard'). The nexus-of-contracts view of the firm[13] is so extensively supported that Allen and Winston (1995) claim that it is the dominant paradigm in modern corporate finance.[14] Hence, a corporation is a legal entity embodying a network of a far-reaching and complex set of contracts (explicit and implicit) among unequal stakeholders.

The notion of ownership is a key element of the network of contractual relationships that build up the concept of firm. Economists, in their analyses of firm ownership have, typically, focused their attention on two key issues: (1) the allocation of residual rights of control and (2) the appropriation of residual returns. Furthermore, as referred by Jensen and Meckling (1976), the "*... specification of individual rights determines how costs and rewards will be allocated among participants in any organization.*" Additionally, as that specification is shaped in a contractual arrangement, the "*... individual behavior in organizations, including the behavior of managers, will depend upon the nature of these contracts.*"

If it were both inexpensive and effortless to write and enforce a complete contract,[15] no eventualities or unpredicted outcomes would ever occur, and no difficulties would arise in ensuring that the contracted actions would materialize. Therefore, if every contingency could be anticipated and unambiguously contracted in advance and fully enforced through the legal system, the allocation of power in such a contractual relationship would be irrelevant.

[13] A pioneering approach was developed by Coase (1937) and more recently suggested by Alchien and Demsetz (1972).

[14] See, for example, Jensen and Meckling (1976), Jensen and Smith (1985), and Milgrom and Roberts (1992). Jensen and Meckling (1976) developed the concept that a firm is a "*... legal entity that serves as a nexus for a complex set of contracts (written and unwritten) among disparate individuals.*"

[15] A complete contract is one that specifies what everyone has to do in every relevant eventuality on any future date and how the resulting income in each event should be divided.

However, as incomplete contract theory posits,[16] writing an *ex ante* all-inclusive voluntary contract proves to be ineffective in governing the relationships between parties, whose transactions are contingent on some future states of nature. Incomplete contracts are characterized for their intrinsic uncertainties (i.e. they do not stipulate the parties' obligations for every conceivable scenario). According to Santos (2003), "*[T]his feature, being a source of serious concerns regarding the opportunistic behavior of parties, represents a promising analytical tool for framing the financial contracting behavior of firms.*"[17] Incompleteness is by far the most fundamental question because it raises the problem of how to allocate controls in situations not covered by the initial contract, the so-called residual control rights. Financial contracts are defined in the incomplete contract literature in terms of how they allocate the referred control rights. Throughout the incomplete contract framework, debt and equity are viewed as standard financial instruments providing controls over managerial decision-making as well as over cash flow streams. This leads us to another weakness of the traditional neo-classical paradigm that views firm's securities as pure financial assets void of any underlying power of economic decision.[18] Nevertheless, as this dissertation intends to build a corporate finance framework in order to explain financing behavior of actual firms, it is important to incorporate the notion that equity securities establish a mechanism for the transfer of corporate control.

The sources of financial capital required to finance the acquisition of assets are both internal and external. The first (retained earnings) depends on the firm's ability to generate cash flows and is reflected in its dividend payout policy. As referred by Modigliani and Miller (1958), "*... as long as management is presumed to be acting in the best interests of the stockholders, retained earnings can be regarded as equivalent*

[16] Hart (1988) presents the "*... insight that the firm as an institution takes on importance only in a world of incomplete contracts.*" See Tirole (1999) and Hart and Moore (1999) for a comprehensive description of incomplete contract theory.
[17] Incomplete contracts allow for *ex-post* opportunism and they also raise the possibility of hold-up problems in relationship-specific investments [Klein, Crawford, and Alchian (1978), and Bolton and Scharfstein (1998)].
[18] As pointed out by Berglöf (1990), "*... in modern finance literature à Modigliani and Miller (1958)* […] *financial instruments only entitle their holders to return streams*". This view is also supported by Milgrom and Roberts (1992) who reported that "*... the neoclassical theory regards financial securities as claims on streams of net receipts whose magnitude and variability are exogenously given.*"

to a fully subscribed, pre-emptive issue of common stock." External financing is provided by investors who buy equity and debt securities through the capital markets and financial intermediaries.[19] Equity holders[20] receive equity stock in exchange for their investment in the firm, entitling them to both a residual claim on the firm's cash flow and the ultimate control over its assets (if the firm does not default after all creditors are fully paid). Debt holders[21] are contractually promised a specific return in non-default states, and a preemptive claim against the firm's assets in default states determined by indentured provisions.[22] As pointed out by Santos (2003) "*... financing a business firm may be viewed as a continuous process of contracting security issues, which are distinct in a number of ways. Among them, contractual arrangements related to investors' returns, control rights, and ease of claim transferability.*" Hence, differences between securities issued by firms are of crucial importance since they represent diverse property and corporate rights.

As suggested above, the dominant paradigm in corporate finance views the firm as a nexus of contracts among various agents, in particular managers and investors.[23] Allen and Winton (1995) point out that "*[B]eginning with Jensen and Meckling (1976), an ever-increasing volume of papers has addressed optimal corporate financial structure within this basic framework.*" These papers can be divided into two major areas of research: one addressing the issue of corporate financing and capital structure – that is, the mix of securities and financing sources used to finance real investments by

[19] It is important to notice that firms also issue securities with features of both debt and equity financial instruments. Convertible debentures, leases, preferred stock, nonvoting stock, and warrants are examples of hybrid securities.

[20] Throughout this dissertation, we refer to shareholders, stockholders, and equity holders as synonymous. They have the responsibility for the operation of the firm through the election of the Board of Directors. Dividends received are not guaranteed and are paid at the discretion of the Board of Directors.

[21] Throughout this dissertation, we refer to bondholders, debt holders, and creditors as synonymous. They have no control rights unless payments by the firm are omitted, in which case they have the right to foreclose on assets or, in some cases, force bankruptcy.

[22] Contrary to equity holders, debt holders have no direct control over a firm's investment decisions except when equity holders' decisions are constrained by debt contract provisions. See Dewing (1934) for a comprehensive distinction between debt holders and equity holders' rights.

[23] The view of the corporation as a 'nexus of contracts' that is popular in financial economics is especially useful in thinking about structured finance (see section 3.2). For example, in project finance transactions (see Annex 2), banks are the architects of the project's contractual structure, and that structure in turn determines the risk pricing of project's debt. So, as referred by Corielli et al. (2010), in project finance "*... it is crucial to design financial contracts and NFCs with the objective to precommitting, when possible, the future behavior of SPV management and its numerous counterparties.*"

corporations – and the other deriving optimal financial contracts as optimal mechanisms for prevailing frictions between agents – the so-called security design literature (see section 2.3).

Theories of capital structure attempt to explain the proportions of debt and equity observed on the right-hand side of a firm's balance sheets.[24] These theories focus on financing strategy, referred by Myers (2003) as "... *the determination of overall debt ratios for a particular type of the firm in a particular setting.*"[25]

But when we look to the way a firm carves up its cash outflows into one or more layers of debt or equity, we see that the composition of financing varies cross-sectionally even within apparently homogeneous industries, and also over time, even when markets, institutions, regulation and taxations are apparently constant. The diversity of financing tactics is remarkable, with innovation in security design to continue apace, for example the design of specific security issues. Allen (1989) corroborates this idea by stating that "*[T]he notion that firms finance their activities with debt and equity is a simplification; corporations have issued securities other than standard debt and equity for many centuries.*" Financial innovation is not a recent phenomenon and has proceeded at a particularly fast pace during the last decades.[26] The rationale of financial innovations has been studied and justified in the literature. For example, Miller (1986) argues that financial innovation is a response to features of the tax code and to regulation. An alternative rationale is stressed by Van Horne (1985): new securities may make markets more complete for the reason that they increase opportunities for risk sharing between investors. The fact that firms issue securities other than debt and equity, and the constant introduction of new and more complex securities, "... *suggest that a more fundamental issue than 'What is the optimal debt-equity ratio?' is 'What are the optimal*

[24] Several studies have examined the capital structure problem since the pioneering work of Modigliani and Miller (1958), which showed the implications of market equilibrium conditions for firm financing structure and valuation. In order to refer to useful surveys on both theoretical and empirical corporate literatures in relation to capital structure, see among others, Myers (1977), Masulis (1988), Copeland and Weston (1988), Harris and Raviv (1991), Megginson (1997), and Myers (2003).

[25]The firm capital structure problem has been a source of intense debate based on the central question of the relevance of strategic financing decisions on a firm's valuation. Most research assumes that: (i) firms are public; (ii) non-financial firms raise capital primarily from outside investors, not from the firm's entrepreneurs, managers or employees; (iii) firms are assumed to have access to *Anglo-Saxon* capital markets and institutions, characterized by a broad, efficient public market for shares and corporate debt, and by reasonably good protection of the rights of outside investors.

[26] See section 2.4 for further discussion of the issue of financial innovation. For a full account of securities innovations, see Finnerty (1988, 1992).

securities that should be issued?" [Allen (1989)].[27] This work intends to follow this perspective focusing on structured finance securities.[28]

2.3. Security Design

"*The existing research on optimal financial contracting has contributed greatly to our understanding of the situations under which actual securities are in fact optimal responses to various capital market imperfections.*"

Allen and Winton (1995)

This section addresses the topic of security design. Taking into consideration that a structured finance transaction is a financing contract with specific features, before we address the topic of structured finance, it is important to review the most prominent literature on security design and more specifically on the design of optimal securities. We start by briefly discussing the security design problem, in an attempt to identify and characterize the basic analytical framework of financing contracting. Next, some of the most relevant papers on optimal financial contracting are discussed. Finally, we compare the contributions of the various papers and provide some concluding remarks.

2.3.1 The Security Design Problem

The undertaking of investment projects and production activities, as well as the associated risk bearing, requires increased pooling of financial capital. Considering that the firm's ability to generate and retain cash flow is typically lower than the required amount of funding, firms tend to become more organized, increasingly large and more complex [e.g., Hansmann (1996) and Easterbrook and Fischel (1991)]. Thus, a wealth-constrained firm owner endowed with a profitable investment opportunity must raise

[27] According to Allen (1989), "*... recent studies of capital structure have taken this perspective* […] *This literature has two branches. The first has been concerned with trying to identify the circumstances in which debt and equity are optimal* […] *The second branch has been concerned with the optimal securities that a firm should issue.*"

[28] See section 3.2 for a more complete description of structured finance.

external funding to finance the project. This leaves him with the classical capital structure problem, i.e., the quantitative definition of the capital mix.

According to the Modigliani and Miller (1958) theorem, under conditions of complete, perfect and frictionless markets, the capital structure choice is irrelevant in terms of the firm market value, which remains unaffected by financing decisions. This theoretical proposition carries the implication that the question of whether debt or equity contracts (securities) are optimal is irrelevant, as well as what the optimal securities a firm should issue are. However, in the real world, markets are neither perfect nor complete; there are costs, including information costs, agency costs, regulatory costs, and transaction costs; and there are benefits attainable through particular capital structures and securities.[29] The capital structure choice and the choice of the type of financing contractual arrangement thus affect the firm market value. Theoretically, it is still not clearly understood why firms' financial contracts recurrently appear in certain patterns [e.g., Harris and Raviv (1989)]. This suggests that we need to invoke a more robust theoretical framework to help us explain the financial behavior of actual real-world firms, namely capital structure and security design.[30]

In an economy obeying the Modigliani and Miller (1958) model,[31] it is possible to design and write an *ex-ante* incentive contract to induce the agent to act in the principal's best interest.[32] If a contract could be written at no cost, laying down each party's obligations and payoffs for any conceivable eventuality in every possible future state of the world, then the so-called agency problems would not emerge.[33] Thus, these problems are associated with: (i) the imperfect observability of agent's actions; and (ii) the costs of writing, executing, and enforcing contracts.[34]

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[29] See Harris and Raviv (1991) for further discussion of this subject.

[30] As pointed out by Allen and Gale (1989) "*[I]n order to develop a theory of optimal security design, it is clearly necessary to develop a framework in which markets are incomplete.*"

[31] Where transaction costs are assumed nil, and observability of agent's actions is perfect and costless.

[32] It is equivalent to writing a complete contract. See, e.g., Tirole (1999) for further details and references to the related literature.

[33] Agency theory attempts to explain the principal-agent relationship using the metaphor of a contract in which one party, the principal, delegates work to another party, the agent, who is empowered with some decision-making power in order to perform that work [see Jensen and Meckling (1976)].

[34] Allen and Gale (1999) suggest that the major barrier to the participation of firms in sophisticated markets is the need for costly *ex-ante* information acquisition. Thus, long-term relationships between intermediaries and firms can work as an effective substitute for costly *ex-ante* information and investigation.

The combined notions of property rights, asymmetric information, and self-interest behavior are an apparently sufficiently rich toolbox to eventually enable an optimization of security design in the context of a firm's financing activity. According to Nachman and Noe (1994), the problem of choosing the optimal financing contractual arrangements and their relative proportions "*is the fundamental capital structure question reformulated (albeit loosely) as a security design problem*." Therefore, a primary concern of designing financial securities is efficient contracting.

In short, understanding the role of security design is difficult, since financial markets are not complete and frictionless. Therefore, it is important to depart from the presumed ideal world of Modigliani and Miller (1958) if we envisage shedding some light on Dowd's (1996) question "*Why do agents use the particular contract forms - debt and equity contracts in particular - that we observe in the 'real world'?*"; i.e., if we want to identify the circumstances under which debt and equity are optimal. However, the constant introduction of new securities and the rapid development of innovative financial products lead us to another fundamental question: *What are the optimal securities to be issued?* These two questions will be considered in the following sub-sections of this dissertation.

2.3.2 Debt (and Equity) as Optimal Contracts

Financial security design theories most often begin with a situation in which a financier contracts with an entrepreneur over the supply of capital in order to finance an investment project. These theoretical frameworks typically specify a number of different assumptions about the features of the contracting technology and environment, which are, in general, related to the observability and contractibility of actions, the ability to renegotiate, the nature of information, agents' risk preferences, and uncertainties. Thus, optimal contractual arrangements derived in the financial contracting literature are mechanisms used to resolve different types of conflicts of interest or asymmetric information problems that arise in agency relationships between economic agents,[35] such as entrepreneurs and financiers.[36]

[35] These include: (i) shirking; (ii) appropriating private; (iii) diverting cash flow; (iv) creating hold-up problems; (v) diluting investors' claims; (vi) asset substitution; and (vii) risk shifting. According to

As referred by Allen and Winton (1995), "*[T]he existing research on optimal contracting has contributed greatly to our understanding of the situations under which actual securities are in fact optimal responses to various capital market imperfections.*" Most of the research carried out on the formal study of financial contracting has been developed along the main argument to be resolved by endogenous contract determination. From this perspective, the literature can be categorized under the following taxonomy: (1) allocation of cash flow rights in agency conflicts; (2) allocation of cash flow rights in adverse selection environments; (3) allocation of ownership and control rights; (4) the allocation of risk; and (5) the acquisition of information [Allen and Winton (1995), and Harris and Raviv (1995)].

Allocation of cash flow rights in agency conflicts

It has been widely accepted that the search for explanations for financial contracting at the firm level should start by assuming a "nothing matters" economy [Modigliani and Miller (1958)]. Then it should, progressively, depart from some of the assumptions included in the capital structure irrelevance theorem. In such an economic environment, market participants enjoy not only homogeneous expectations about the outcomes of investment projects, but also are endowed with perfect, unlimited and costless information. With this line of reasoning in mind, we can conceive the possibility that the return generated by a project is only observed without cost by an entrepreneur, and any other entities would have to pay a fixed monitoring cost to become informed about the project's cash flows. This framework broadly characterizes the Costly State Verification (CSV) environment originally developed by Townsend (1979), which has

Holmström's (1979) approach to the principal-agency problem, an agent's effort is presumed unobservable to the principal. In this instance, the optimal incentive contract ensures that the agent puts in an adequate level of effort by making the agent's compensation dependent on the outcome of signals, namely, output or profits. In Harris and Raviv's (1979) model, the optimal financing contract between wealth unconstrained and risk-neutral contracting parties, is to give a fixed payment to the principal and make the agent the residual claimant. Both theories emphasize the role of cash flow rights (monetary incentives) to the entrepreneur. Ownership is relevant only because it affects pure cash flow rights.

[36] Ultimately, conflicts of interest depend on the precise nature of the contracts that govern the relationship between managers and the owners, as well as on the firm's financial structure. Since managers are responsible for control, we can identify a triangular agency relationship between the manager and the investors with residual claims (equity holders) and the investors with fixed claims (debt holders). Agency problems can also arise between majority equity holders and minority equity holders as well as between lending banks and bond holders.

allowed "*considerable progress* […] *in explaining basic contract design and, to a lesser extent, financial structure*" [Dowd (1996)].[37]

An understanding of various features of the security design problem can be achieved using the principal-agent approach. In a principal-agent relationship, a firm's insiders are more likely to be systematically better informed compared to their outside investors. Thus, there is the potential for various forms of opportunistic behavior whenever insiders have incentives to engage in wealth transfers at the expense of outside investors. One of the contributions of Townsend (1979) is the explanation of how private information about a project's realization and its (*ex-post*) verification costs determine the extent to which optimal financial contracts have some debt features.[38]

Townsend's work was further extended, among others, by Diamond (1984), and Gale and Hellwig (1985). Their lines of reasoning include the introduction of broader modeling environmental conditions, such as less restrictive parties' risk preferences (agents are risk neutral), multiple-period contracting, and non-pecuniary penalties. In Diamond (1984), the optimality of the debt financing contract is enforced by potentially unlimited non-pecuniary penalties which inflict adverse effects on borrower's wealth in certain states. Gale and Hellwig (1985) prove, under less restrictive assumptions, that the optimal financing arrangement is the (single period) standard debt contract.[39] They also show that, with a positive probability of bankruptcy, there will be less borrowing and investment than there would be with symmetric information. On the other hand, Williams (1987) argues that debt and equity may be optimal from an incentive point of view. Lacker (1990) generalized Diamond's model and showed that, when a borrower holds an asset with a higher marginal utility for the borrower than for the lender, a debt contract collateralized by this asset is optimal.[40] Some examples include, as pointed out by Allen and Winton (1995), "*... home mortgages, car loans, or loans backed by a new*

[37] The costly state verification model is a significant contribution for the contract theory. For in-depth, comprehensive discussions of contract theory see, e.g., Salanié (1997).
[38] The entrepreneur fully pays the fixed claim when a company earns sufficient funds. Otherwise, the entrepreneur prefers to pay the lower state verification cost and impose some loss on the investors. This is basically the same as taking a first loss position in a securitization transaction.
[39] By a standard debt contract Gale and Hellwig (1995) "*... mean a contract which requires a fixed payment when the firm is insolvent, requires the firm to be declared bankrupt if this fixed payment cannot be met and allows the creditor to recoup as much of the debt as possible from the firm's assets.*"
[40] In Diamond's model, the collateral takes the form of the borrower's freedom from pain and suffering, which has no value to the lender.

business' assets, where individual tastes, lemons markets effects, or specialized managerial skills may make collateral more valuable to the borrower than to the lender." Following Diamond (1984), Gale and Hellwing (1985), and Williamson (1986, 1987), Boyd and Smith (1994) developed a model where costly verification of project outcomes can be done stochastically. In such a case, they showed that standard debt contracts are "*... almost optimal contracts*".[41]

Although these models present debt as optimal contracts, they use several simplifying technical assumptions.[42] Some papers allow for additional complications, namely: (1) agents exhibit risk averse behavior; (2) there are multiple types of borrowers; (3) firms typically exist for many years; (4) agents may be able to randomize their decision; and (5) firms usually borrow from multiple investors. Krasa and Villamil (1994) and Winton (1995) show that Townsend's results are valid in the case where both agents are risk averse. In Winton (1995),[43] when the borrower can borrow from multiple investors he prefers to issue debt-like contracts with varying degrees of seniority rather than symmetric debt-like contracts.[44] This follows from the fact that "*... if verifying returns is costly and private, assigning different levels of seniority to different investors reduces the duplication of verification costs* [and] *the number of investors who verify at the margin*" [Winton (1995)]. Winton's model can be applied to explain some features of structured finance transactions. In a Leveraged Buy-Out (LBO) many classes of debt and preferred stock are typically issued, and the most junior claims are held by management and a buyout fund that monitors management closely.[45] The second application is asset securitization,[46] where relatively small financial claims are pooled by an intermediary and then refinanced. In securitization, two or more tranches are issued with different degrees of seniority among investors, the originating institution

[41] Diamond (1984), Gale and Hellwing (1985), and Williamson (1986, 1987) show that when state verification is carried out nonstochastically, the optimal contract is a standard debt contract.
[42] Like risk neutrality, single period contracting, with one investor, one type of investor, and deterministic verification.
[43] Winton (1995) developed a model where a manager's firm requires funds from several investors – contrary to Williams (1989), Hart and Moore (1990a), and Diamond (1991, 1993) where investors are small, numerous, and risk neutral, share the same information, and can collectively enforce liquidation. Additionally, an investor can only observe and verify the firm's return privately and at a cost.
[44] According to Allen and Winton (1995), "*[T]his corresponds with actual practice, in which the absolute priority rule is the basic standard and firms issue securities with multiple levels of seniority – senior debt, subordinated debt, or preferred stock.*" Absolute priority rule means that senior claims are to be paid in full before more junior claims receive anything.
[45] See Annex 4 for an overview of Leveraged Buy-Out transactions.
[46] For an overview of securitization see Annex 1.

typically agrees to buy the tranche's 'first loss',[47] and 'credit enhancement' is often provided by a third-party who provides coverage for additional losses up to a fixed amount. As referred by Winton (1995), "… *the junior claimants are institutions that are best placed to perform verification or monitoring at low cost, whereas the purchase of the securities need not have such expertise.*"

Chang (1990) proved that with multi-period contracts in a setting where a firm produces independent returns in each of the two periods, the optimal contract has some resemblance to a bond with interim coupon. Considering that borrower return distributions are completely unobservable, Boyd and Smith (1993) point out that debt is an optimal contract when verification costs are positive. Lacker (1989) develops a more complex form of Hart and Moore's (1989)[48] problem – now contracts based on returns can be enforced in a court of law at a cost – and show that optimal contracts resemble debt so long as enforcement is used deterministically. Chang (1993) presents a model in which a firm exists for two periods. Once contracts are allowed to include a bankruptcy mechanism, the optimal contracts resemble debt.

Hence, when the basic costly state verification model assumptions are relaxed, optimal contracts still have certain features in common with real debt or debt-like securities, namely: interim coupon payments, multiple levels of seniority, and credit rationing.

A related body of literature takes on principal-agent theory to financial contracting between an investor and the manager of a firm. According to Harris and Raviv (1979), the manager's position corresponds to unlimited liability equity, while that of the investor corresponds to riskless debt. Assuming that manager's wealth is usually limited, Innes (1990) argues that if the investor's compensation is constrained to being monotone increasing with a firm's returns, the optimal contract will be debt. Based on a similar setting, Chiesa (1992) shows that a debt contract with warrants is optimal for the lender, instead of standard debt. Williams (1989) proves that when the firm's output and

[47] This means that the originator takes all credit losses up to a certain percentage of assets' value. First loss tranche is also called equity, residual or junior tranche (especially used for the highly leveraged first-loss slice of a portfolio of highly rated assets). However, it cannot be confused with common equity issued by firms with ongoing businesses.

[48] Hart and Moore (1989) shows (in the case an entrepreneur wishes to raise funds to undertake a project when contracting possibilities are incomplete) that the optimal contract is a debt contract and incentives to repay are provided by the ability of the creditor to seize the entrepreneur's assets.

the managerial effort is unobservable, optimal contracts resemble combinations of equity and up to three classes of debt. Hart and Moore (1990a) provide interesting results on how different levels of seniority of debt contract can mitigate agency problems. They argue that a firm can only raise new funds if it is expected that new projects will have a positive Net Present Value (NPV).

Santos (1997) developed a principal-agent model and showed that when the investment's outcome depends on more than two control variables (controlled by the entrepreneur), debt and equity contracts can be simultaneously optimal. DeMarzo and Fishman (2007a) developed an agency model of financial contracting and assumed that the (risky) cash flows are observed only by the agent and, hence, are not directly contractible. They also argued that the optimal contract is a combination of outside equity and debt.[49]

To conclude, in the context of a standard formulation of external financing, the security design problem consists of devising an optimal financing contract (security), which outside investors do not have the incentive to misprice. In the CSV framework, most commonly, debt contracts arise as the optimal contractual arrangement. However, as Townsend points out, his model is not helpful in explaining why firms resort to outside equity financing. Moreover, the optimality of debt disappears in this model once one brings in dynamic considerations such as repeated interactions between the debtor and creditor or *ex-post* renegotiation. Under other theoretical approaches, outside equity contracts may also be efficient.

Allocation of cash flow rights in adverse selection environments

Adverse selection models are driven by the assumption that asymmetry involves *ex-ante* information. Thus, the focus is on the characteristics of the contracts borrowers use as signals of their type. Hart and Holmstrom (1987) suggest that optimal contracts should be contingent on all relevant information. However, as referred by Allen and Winton (1995), "*… an important feature of many existing financial contracts is that they are not*

[49] DeMarzo and Fishman (2007) "*… derived long-term debt, a line of credit, and equity as optimal securities.*" This paper is part of a growing literature on dynamic optimal contracting models using recursive techniques that begun with Pheland and Townsend (1991), and Atkeson (1991), among others. See, e.g., Ljungqvist and Sargent (2000) for a review of many of these models.

contingent on easily available information which would appear relevant."[50] Among others, Allen and Gale (1992), De and Kale (1993), and Nachman and Noe (1994) show that, with adverse selection, noncontingent securities, like standard debt, are optimal contracts.[51]

An early stream of this literature is driven by the impact of market imperfections and the economic characteristics of firms concerning their choice of debt maturity. It is mainly concerned with the effects of market frictions and imperfections, such as transaction costs, taxes, and interest rate risk on firms' debt maturity decisions. Most papers emphasize the advantages of short-term maturities in debt contracts as an effective mechanism to mitigate agency problems, under asymmetric information and imperfect or costly contract enforcement.[52] When the information about the true quality of a firm's assets is asymmetrically distributed between insiders and outsiders, financing decisions at large, and short-term debt issues in particular, may be perceived by market participants as signaling firm asset quality as suggested in, e.g., Flannery (1986) and Diamond (1991). In this framework, there may be a potential advantage for short-term debt [Myers (1977)].

Flannery (1986) presents a signaling model where the insiders of the highest quality firms will prefer to issue short-term debt, exposing the firm to the liquidity risk. In contrast, managers of firms with less favorable prospects will be unwilling to take such risk, and will therefore prefer to issue long-term debt. Diamond (199l, 1993) explains the maturity / seniority structures of debt contracts in terms of the non-observability of the credit quality of a borrower's project. Diamond (1991) shows that, in the presence of liquidity shocks and appropriation of private rents associated to control rights, short-

[50] As an example, Allen and Winton point out that standard debt contracts are not contingent on the firm's earnings.

[51] Allen and Gale (1992) present a model where adverse selection interacts with measurement distortion and this leads to noncontingent securities being used. Considering that securities cannot be made contingent on all states of nature, bad firms are more likely to offer securities such as income bonds since the net benefits of distorting are greater for bad firms. According to Nachman and Noe (1994), in equilibrium firms choose contracts in which payments are stable or equal, except when there are insufficient earnings to pay the amount. De and Kale (1993) assume that a firm can use a combination of Fixed-Periodic-Obligation Debt (e.g., standard debt) and No-Periodic-Obligation Debt (e.g., income bonds). They find a unique equilibrium when firms use only Fixed-Periodic-Obligation Debt.

[52] After an initial impulse provided by Myers (1977), a strand of theoretical literature developed focusing on the impact of asymmetric information on the debt maturity decision.

term debt dominates.[53] Moreover, he also shows that debt maturity choice is modeled as a trade-off between the managerial preference to issue short-term debt and the liquidity risk associated with short-term debt financing.[54] In 1993 Diamond developed a model in which a firm's manager can choose debt seniority, as well as maturity. It shows that (1) short-term debt is optimal when it is senior; (2) long-term debt is optimal when it is junior; and (3) long-term debt is optimal when it allows the issuance of additional senior short-term debt at the interim date. Thus, firms will obtain a better price for short-term debt in a situation whereby short-term debt holders can be refinanced at the expense of long-term debt holders. Hart and Moore (1994) examine the relationship between the maturity of firms' debt and the timing of project realizations, and conclude that the maturity of assets and liabilities should be matched.

Repullo and Suarez (1998) follow the literature on debt contracts focusing on the disciplinary role of liquidation, and develop a model that moves into a moral hazard context. They argue that the level of entrepreneurial wealth and the liquidation value of the investment project are key determinants of the optimal mode of finance. As pointed out by the authors, "*[O]ur results predict that, in order to give the informed lender the right incentives to liquidate, informed debt will be, in case of liquidation, secured and senior to uninformed debt.*"[55]

Allocation of ownership and control rights

Another strand of literature has focused on the allocation of ownership and control rights among different investors (rather than focusing on the allocation of cash flows to and among investors as discussed in the previous two subsections).[56] If both parties in a financing arrangement could write a contract without costs, contingent upon all possible

[53] According to Diamond (1991), "*... there is a credit rating such that those with higher ratings prefer short-term debt as a type of 'bridge financing' that allows them to choose to refinance when good news arrives, while lower rated borrowers prefer long-term debt.*" Although, borrowers with low credit rating may have no choice but to choose short-term debt.
[54] For other approaches to the debt maturity structure problem see, for example, Goswami, Noe and Rebello (1995, 1997), and Hart and Moore (1994).
[55] Repullo and Suarez (1998) consider that bank lending or the issuance of tightly held securities can be considered as informed finance, whereas the placing of public traded securities (such as corporate bonds) can be considered as uninformed finance.
[56] Research on ownership and control focuses not only on managerial incentives (agency/costly state verification) but also on investors' incentives.

states of the world, and lawfully enforceable, then the allocation of power in such a contractual relationship would be irrelevant. Additionally, there would be little room for the exercise of ownership and control rights. In this case, all relevant decisions would be made *ex-ante*.

As referred by Allen and Winton (1995), "*[W]ork on allocation of control among different securities typically focuses on the role of outside debt and equity. The basic role of outside debt in these models is illustrated by Aghion and Bolton (1992)…*" Aghion and Bolton (1992) examine a project's long-term financing in an incomplete contracting framework [along the lines of Grossman and Hart (1986) and Hart and Moore (1990b)]. An important result of their analysis concerns the implications of the standard debt contract in terms of the optimal (contingent) allocation of control rights.[57] Although Kalay and Zender (1992) present similar results, Zender (1991) argues that the use of both outside debt and outside equity is optimal.[58] Aghion and Bolton (1992) and Zender (1991) show that contracts with contingent transfer of control rights may minimize inefficiencies, which provides a rationale for debt contracts. Bearing in mind the basic problem of Hart and Moore (1989),[59] Berglöf and Von Thadden (1994) point out that when a single investor provides all financing, optimal capital structure consists of short-term secured debt and long-term claims such as debt and equity. Additionally, Dewatripont and Tirole (1994) argue that debt provides (*ex-ante*) incentives to managers to be committed to an (*ex-post*) course of action.

Other related literature includes Bolton and Scharfstein (1990), Bulow and Rogoff (1989), and Hart and Moore (1994). Bolton and Scharfstein (1990) develop a theory in which the threat of restricting future financing provides an incentive to fulfill a

[57] Aghion and Bolton (1988) argue that the use of debt by the entrepreneur and the institution of bankruptcy constitutes a mechanism that grants control to the entrepreneur when earnings prospects are good and to the investor when they are bad. They use an incomplete contracting framework to argue that debt-like contracts may improve efficiency by allocating control rights to the debt holders in the event of bankruptcy.

[58] In a similar vein of Hart and Moore (1988) – examine state-contingent property rights associated with debt and equity –, Zender (1991) views bankruptcy as an efficient transfer of firms' control to the debt holders.

[59] Hart and Moore (1989) developed a model of an entrepreneur who wishes to raise funds to undertake a project when contracting possibilities are incomplete. They pointed out that the optimal contract is debt and the incentives for the entrepreneur to repay the borrower funds are provided by the threat of liquidation.

promised repayment schedule of a debt contract.[60] Bulow and Rogoff (1989) present a model in which a sovereign debtor cannot commit to loan repayment and uses strategical debt repayment schemes. The theory builds on the assumption that the country is able to repudiate debt, exposing itself to the potential retaliation of lenders. In such a case, future renegotiation is unfeasible. Hart and Moore (1994) developed a model with an intuition analogous to Hart and Moore (1998),[61] Bolton and Scharfstein (1990), and Fluck (1998).[62] These theories are rooted on the hypothesis that project's realizations are either unobservable or not verifiable, and assume that such an environment allows the potential appropriation of private rents related to control rights.[63] Hart and Moore (1994) relax some of the assumptions of the referred papers and place importance on the effects of human capital inalienability over a project financing. They conclude that the optimal contract mirrors a debt security in which control is transferred to the creditor if the promised payment is not fulfilled, and it triggers liquidation.[64]

Anderson and Sundaresan (1996) study the design (and valuation) of debt contracts in a dynamic setting under uncertainty. They show that: (1) contrary to low growth firms, high growth firms tend to use low coupon debt contracts; (2) firms tend to increase coupon rates as tax rates increase to take advantage of tax shield; and (3) highly levered firms tend to use low-coupon debt.

[60] They show that the optimal contract is debt, and if the agent defaults he/she faces a cost that can be interpreted as not being refinanced in the future. Quadrini (2004), Clementi and Hopenhayn (2006), and DeMarzo and Fishman (2007b) developed a multiperiod version of this model and also allowed for the determination of the firm's scale.

[61] Hart and Moore (1998) analyzes "*... the role of debt in persuading an entrepreneur to pay out cash flows, rather to divert them.*" They argue that debt does a good job in maximizing the entrepreneur's resources in 'good' states of the world, and in maximizing the investor's payoff in bad states of the world. This enables the entrepreneur to reinvest as much as possible when reinvestment is more valuable.

[62] Fluck (1998) demonstrates that "*... no investor is willing to hold outside equity when management has the ability to divert cash flows as private benefits and when management manipulation of cash flows is costly to verify.*" He argues that besides debt, outside equity with unlimited life is the financing choice of positive NPV projects. Therefore, the entrepreneur may issue debt, outside equity, or a mix of the two when cash flows are stable. However, even in a situation in which cash flows variability is high and "*... no funds can be raised by issuing debt, investors may still be willing to provide outside equity financing.*" [Fluck (1998)].

[63] For a theoretical discussion of corporate ownership and control see Bebchuk (1999).

[64] Hart and Moore (1994) conclude that the optimal financial claim resembles a debt contract in which (1) the entrepreneur promises a fixed payment to the financier; and (2) the financier takes control of the project and liquidates the assets if debt is not fully repaid. Thus, the right to liquidation is central in these models.

At the empirical level, Kaplan and Strömberg (2000) examine contracts between venture capitalists and entrepreneurs. They find that venture capital contracts include provisions that appear to be designed to mitigate potential hold-up problems between entrepreneurs and investors. Their findings suggest that (i) cash flow rights matter in a way that is consistent with principal-agent models; (ii) control rights matter, which strongly suggests that contracts are incomplete; and (iii) cash flow rights and control rights can be separated and made contingent on observable and verifiable measures of contractual performance.[65]

The allocation of risk

As referred by Allen and Winton (1995), "*[T]raditional financial theories suggest that one of the major advantages of having different types of securities is that they allow different groups of investors with different risk tolerance to bear the amount of risk they desire.*" This leads to another fundamental question: '*How securities should be designed when risk sharing is the main issue?*'

Several authors have studied this issue based on transaction costs as a source of market incompleteness. Allen and Gale (1989) developed a perfectly competitive, symmetric information model, where there are transaction costs and concluded that the price of a security is determined by the group that values it most, and that debt and equity are not optimal (optimal securities are extreme). Allowing for the cost of marketing securities as the relevant transaction costs, Mandan and Soubra (1991) point out that, in some cases, equity, debt, and warrants are optimal (optimal securities are no longer extreme). Pesendorfer (1995) formulated a model related to Ross (1989) and introduced financial innovation. He showed that (1) innovation can improve agents' utilities by reducing costs of marketing; (2) the level of innovation is not necessarily constrained efficiently; and (3) innovation eliminates indeterminacy observed in other models. An approach to security design is developed by Allen and Gale (1991), who assume an environment in which the set of traded securities is endogenous and investors are permitted to undertake

[65] These results are consistent with theoretical predictions by Aghion and Bolton (1992) and Dewatripont and Tirole (1994). Another related literature focuses on the design of ownership (equity) structure – allocation of shares to different investors, allocation of liability to shareholders, and allocation of control among shares. As this dissertation focuses on debt financing, such papers have not been reviewed.

unlimited short sales. In this environment, and contrary to Allen and Gale (1988) where short selling is severely limited, an equilibrium exists. Besin (1993) uses an imperfect model akin to that in Allen and Gale (1991) to reassess the Balasko and Cass (1989) and Geanokoplos and Mas-Colell's (1989) real indeterminacy result. The author argues that the real indeterminacy is removed by the introduction of intermediaries who choose securities and that the real determinacy of equilibrium does not depend on the level of transaction costs.

Considering the optimal security design problem, Fulghieri and Lukin (2001) argue that "*... depending on the cost and precision of the information-production technology, risky debt or a composite security with convex payoff emerges as optimal securities.*"[66] Their model can be applied to the field of structured finance. Regarding securitization, the originator may prefer to issue a security with 'high information sensitivity' if he intends to maintain a residual equity position in the pool of assets.[67]

The acquisition of information

It is widely accepted that the volume of information held by investors affects the value of a security. Thus, securities can be designed to affect the extent to which information is acquired in order to maximize value. In this line of reasoning, Boot and Thakor (1993) developed a model where a firm issues securities to investors who have to pay to become informed on the firms' value. They argue that (1) good firms have incentives to provide as much information as possible to investors, and by splitting their cash flows between risky (equity) and safe groups (debt) of securities they provide better incentives for investors to become informed; and (2) bad firms plan to imitate good firms, so they can receive on average the value of the two. An extension of the Boot and Thakor (1993) model is formulated by DeMarzo and Duffie (1997)[68] in which they analyze the effect of information acquisition on the design of securities like collateralized mortgage

[66] They argue that when investors can produce information on the quality of the firm, the type of securities issued matters. In this case, insiders "*... may prefer to issue a more information-sensitive security such as equity, rather than a less information-sensitive one such as risky debt.*"
[67] In such cases, the originator signals their incentives to monitor by maintaining an equity position.
[68] DeMarzo and Duffie (1997) consider a situation where the information received by investors does not signal firm type and there are many firms. In this case, it is worthwhile to package the securities and then to split this portfolio into a risky and safe component, which is consistent with the fact that financial intermediaries pool assets and then issue multiple securities against them (i.e., with asset securitization).

obligations (CMOs). They show that marginal cash flows should be allocated to one security or another rather than split between securities. Gale (1992) argues that if all firms intend to issue new securities a Pareto superior equilibrium could result. Conversely, the investors' preference for standard securities can lead to an undesirable equilibrium, because – as the information about new securities is costly – investors will demand a premium from the issuer. Considering a noisy expectations model, Demange and Laroque (1995) study the relationship between private information and the design of securities. They point out that to overcome the unwillingness of investors to trade with entrepreneurs (due to entrepreneur superior information), they can design the securities sold, so that they are uncorrelated with their information. Rahi (1995) develops a similar model but without noisy traders and shows that equity is the optimal security.

In Rajan and Winton (1995), attention turns to covenants and collateral as common features of loans made by financial institutions.[69] They point out that long-term debt with covenants is preferable to short-term debt, "*... as long as the covenants depend on information that is not costlessly available to the public.*" With regard to collateral, they argue that the type of collateral signals the borrower's economic situation – the signal is stronger when the collateral is risky in the short-run or depreciates quickly (e.g., accounts receivable or inventory *versus* plant, equipment or land). Similarly, Goswami, Noe and Rebello (1995) argue that covenanted long-term debt, contrasting to uncovenanted long-term debt, tends to cause negative announcement effects.[70]

Inderst and Mueller (2006),[71] conclude that "*... debt is optimal when the lender is too conservative, an equity is optimal when she is too aggressive* […] *Ultimately, debt is optimal for relatively safer projects…*[and]*... levered equity is optimal for projects that are less likely to break even based on public information*." This confirms observed patterns of Project Finance whereby transactions are predominantly financed with debt.

[69] Rajan and Winton (1995) investigate how loans can be structured to enhance the institutions' incentives to monitor. Several authors have studied this issue. For example, Smith and Warner (1979) argue that control rights from covenants reduce adverse selection and moral hazard. Park (1994) shows that covenants serve as mechanisms that improve the flexibility and efficiency of financial contracting.

[70] As referred by Goswami, Noe and Rebello (1995) "*... the use of covenant restrictions on long-term debt dominates the use of short-term debt as a means of signaling information.*"

[71] They developed a model in which lenders can be too conservative and reject positive-NPV projects or too aggressive and accept negative-NPV projects.

2.3.3 Concluding Remarks

The literature on optimal financial contracting can be classified based on a relatively stable taxonomy. The first group of models – allocation of cash flow rights in agency conflicts – view financial contracts as mechanisms to efficiently align the interests of entrepreneurs with outside investors. In these models, insiders presumably have the ability to appropriate (at least partially) project's income, and have access to private benefits of control. In this framework, securities are designed to induce sufficient payout to finance investment projects. Under these conditions, it has been shown that the debt contract is the only optimal contract when lenders cannot observe borrowers' income without costs.[72] In this class of models, 'equity' is entirely owned by the entrepreneur (insiders), and all external financing is raised under the form of debt contracts.[73] The models developed into the second set of theories are driven by adverse selection considerations – allocation of cash flow rights in adverse selection environments. At this point, securities are designed to signal borrower's private information to lenders.[74] The third group consider the role of securities in the allocation of ownership and control rights.[75] In the fourth group of models, securities are designed to optimize the information that investors have – acquisition of information.[76] The fifth category includes models representing the allocation of risk among the different kinds of investors.[77]

This subsection refers to some circumstances where debt and equity are optimal financial contracts. However, "*... the long history and extent of financial innovation suggest that firms' financing needs are not satisfied by debt and equity.*" [Allen (1989)]. This is the reason why one branch of the security design literature has been focused on optimal securities, instead of the circumstances under which debt and equity are optimal. Theories of optimal securities are based on the reality of incomplete markets. However, the literature to date does not provide much insight into the actual path of most financial innovations and structured finance products.

[72] See, e.g., Fluck (1998) and Myers (2000).
[73] See, e.g., Townsend (1979), Diamond (1984), Gale and Hellwig (1985), Hart and Moore (1989), Lacker (1990), and Winton (1995).
[74] See, e.g., Diamond (1991), De and Kale (1993), Diamond (1993), and Nachman and Noe (1994).
[75] See, e.g., Grossman and Hart (1988), Harris and Raviv (1988), Zender (1991), Aghion and Bolton (1992), and Hart and Moore (1994).
[76] See, e.g., Boot and Thakor (1993), and DeMarzo and Duffie (1997).
[77] See, e.g., Allen and Gale (1988, 1991, 1994), Bisin (1993), and Pesendorfer (1995).

To summarize, although all models yield a number of important insightful predictions, firms' financial and financing structures decisions still remain unsatisfactorily explained, mainly (i) in terms of structured finance transactions, and (ii) with respect to the reason why firms decide to use structured finance instead of common debt. One possible explanation is that existing security design theories do not simultaneously and dynamically endogenize all contractual features.

2.4. Financial Innovation and Security Design

2.4.1 Introduction

Tufano (2003) defines financial innovation as an ongoing process whereby private parties experiment to differentiate their products and services, responding to changes in the economic environment; *broadly speaking, "... financial innovation is the act of creating and then popularizing new financial instruments as well as new financial technologies, institutions and markets.*"[78] The author breaks down financial innovation into product innovation – e.g., new derivative contracts or new corporate securities – and process innovation – e.g., new forms of distributing securities, new forms of processing transactions or even new forms of pricing securities. According to Frame and White (2004) financial innovation "*... represents something new that reduces costs, reduces risks, or provides an improved product/service/instrument that better satisfies participants' demands.*" Thus, financial innovations can be sorted as new products, new services, new production processes, or new organizational forms.[79]

Some authors focus on the creation of lists or taxonomies of innovations. For example, regarding securities innovations, Finnerty (1988, 1992) has created a list of over 60 securities innovations organized by the type of instrument and by the function served.[80]

[78] While presented to a fairly modest extent, relative to other topics in Corporate Finance, the topic of financial innovation is addressed in comprehensive books [e.g., Allen and Gale (1994)] and in entire issues of journals [e.g., Journal of Economic Theory (1995, Vol. 65)].

[79] Ross (1989) presents two classes of financial innovations: (i) the new securities and their markets; and (ii) the dynamic trading strategies that make use of new instruments or products.

[80] Innovative financial instruments include debt innovations, preferred stock innovations, convertible debt/preferred stock innovations, and common equity innovations. Considering the function served, Finnerty (1988) organize securities based on their capacity to solve corporate finance problems: reallocating risk; increasing liquidity; reducing agency costs; reducing transaction costs; reducing taxes; or circumventing regulatory constrains. Carow et al. (1999) extends Finnerty's (1992) work by updating

Even in the book *Security Analysis*, Graham and Dodd (1934) included an appendix with a "*... partial list of securities which deviate from normal patterns.*" The many lists produced of financial innovations – by traditional labels of equity or debt or by product feature – show a significant difficulty in categorizing new products. Therefore, most authors adopted a functional approach to classify financial innovations – while the functions of financial systems and products are stable, the ways in which they are performed are not.[81]

According to Fabozzi (2005), financial innovations can be classified by specific functions: (i) price risk-transferring innovations, (ii) credit risk-transferring innovations, (iii) and liquidity-generating innovations. The first type of financial innovations allows market participants to manage exchange rate risk or price risk. Credit risk-transfer innovations provide sponsors with instruments for dealing with the risk of default. Liquidity-generating innovations have three effects: (1) enabling the financing of an asset based on new sources of funds, (2) amplifying the liquidity of the financial market, and (3) enabling financial institutions and other market participants to exploit capital arbitrage circumventing capital constraints imposed by regulators and rating agencies. Although the authors present their own taxonomy of functions, no commonly accepted classification has been adopted. Additionally, a single innovation is likely to address multiple functions. For example, using the Fabozzi's (2005) functional perspective, asset securitization invokes all three functions.[82]

As suggested by Finnerty (1988), when discussing financial engineering, referred to by the author as the means for implementing financial innovation, "*... the deregulation of the financial services industry and increased competition within investment banking have undoubtedly placed increased emphasis on being able to design new products,*

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the list of securities innovations through to the end of 1997 and provides evidence that "*... the pace of innovation on securities design has not slackened.*"

[81] See, e.g., Finnerty (1988, 1992) and BIS (1986). Merton (1992) advances the notion of 'function' as critical in understanding financial systems. Referring to financial intermediation, Merton (1995) presents the functional perspective as a ready alternative to the institutional perspective, mainly in financial environments characterized by rapid changes. As pointed out by Merton (1995), "*... with the current rate of technological advance and integration of world financial markets, this approach may prove especially useful in predicting the future direction of financial innovation, changes in financial markets and intermediaries and the places for regulatory bottlenecks*."

[82] As pointed out by Fabozzi (2005), "*[A]sset securitization provides all of these functions* […] *asset securitization results in securities whose liquidity is greater than that of an unsecuritized portfolio of loans or receivables, borrowing from ultimate investors who would not ordinarily want to hold a portfolio of loans or receivables, and reduction by depository institutions of their capital requirements by transferring assets off their balance sheets.*" For further discussion of asset securitization see Annex 1.

develop better processes, and implement effective solutions to increasingly complex financial problems." The design of new securities or products – securities innovation – is widely accepted as a central activity in the financial engineering process.[83] Securities are thus designed to achieve many purposes, namely: (i) entrepreneurs and firms intend to raise capital efficiently; (ii) managers use securities to signal the firm's potential value; (iii) intermediaries hope to profit from offering securities designed to accomplish investors' needs; and (iv) regulators consider the role of security design and financial innovation in promoting efficiency in the allocation of risk and capital [Duffie and Rahi (1995)].[84]

2.4.2 Functions Served by Financial Innovation

The existence of financial innovation has been studied and justified in the literature on the grounds of a healthy panoply of arguments.[85] The most prominent explanations are rooted to the attempts to understand how various market imperfections and even the change of these imperfections stimulate financial innovation. As referred by Tufano (2003), "*[T]hese imperfections prevent participants in the economy from efficiently obtaining the functions they need from the financial system.*"[86] Van Horne (1985) argues that in order for a new financial product, instrument or process to be truly innovative, it must enable financial markets to become more efficient or make them more complete. If

[83] According to Finnerty (1988), corporate financial engineering has three types of activities: (i) securities innovation – involves the development of innovative financial instruments; (ii) financial processes innovation – reduces the cost of implementing financial transactions; and (iii) creation of creative solutions to corporate finance problems. Banks (2006) defines financial engineering as a process that is related to the "*... creation of new products that are useful to intermediaries and end-users. It involves identifying a particular need, determining how best to address the need, assembling the necessary building blocks, and delivering the finished product to the user.*"

[84] Carow et al. (1999) suggest that "*... three of the most common objectives of innovative security design have been to (1) manage the interest rate (and other financial price) risk faced by investors and issuers; (2) to reduce information costs faced by investors* […]*; and to (3) increase the tradability of financial assets.*"

[85] Nevertheless, according to Frame and White (2004), "*[A] striking feature of this literature, however, is the relative dearth of empirical studies that specifically test hypotheses or otherwise provide a quantitative analysis of financial innovation.*"

[86] According to Bhattacharyya and Nanda (2000), the literature on financial innovation has three main strands: (i) literature that analyzes the advantages of several innovations [e.g., Finnerty (1992), Allen and Gale (1994)]; (ii) literature that studies the forces that drive financial innovation activity [e.g., Van Horne (1985), Miller (1986), Ross (1989), Merton (1992), and Allen and Gale (1994)]; and (iii) literature that relies on signaling rationale [Tufano (1989), Boot and Thakor (1997), and Bhattacharyya and Nanda (2000)].

the financial markets were perfect and complete, there would be no opportunities for financial innovations.

Thus, the rationale for the emergence of financial innovations as an endogenous response to market and contracting incompleteness and imperfections, should be seen as economically advantageous in,[87] *completing inherently incomplete markets* [e.g., Allen and Gale (1989), Ross (1989),[88] Duffie and Rahi (1995),[89] and Grinblatt and Longstaff (2000)[90]], *reducing or mitigating agency concerns and information asymmetries* [e.g., Haugen and Senbett (1981) and Ross (1989)],[91] *reducing transaction, search or marketing costs* [e.g., Merton (1989), Ross (1989), Madan and Soubra (1991), and McConnell and Schwartz (1992)],[92] *responding to taxes and regulation* [e.g., Miller (1986),[93] Campbell (1988), Finnerty (1988), Kane (1986),[94] Santangelo and Tufano

[87] The list provided by Tufano (2003) is the most inclusive, and we will draw heavily on it.

[88] Ross (1989) points out that the explosion of financial innovations, manly fixed income instruments, is commonly explained by the capacity of these new instruments to complete financial markets. But the author also focuses on institutional markets and financial marketing as central dimensions to understand financial innovation – according to Ross (1989) "*... marketing costs help to shape the form of the new institutional features.*"

[89] Duffie and Rahi (1995) review the literature on market incompleteness and innovation and conclude that "*[A]t this early stage, while there are several results providing conditions for the existence of equilibrium with innovation, the available theory has relatively few normative or predictive results. From a spanning point of view, we can guess that there are incentives to set up markets for securities for which there are no close substitutes, and which may be used to hedge substantive risks.*"

[90] Grinblatt and Longstaff (2000) examine Treasury STRIPS (or zero-coupon bonds) and find that investors use the STRIPS program primarily to make markets more complete.

[91] As pointed out by Tufano (2003), "*[T]hroughout history, information asymmetries have prompted a number of innovations… Early innovations tended to substitute for (or economize on) the use of costly information, while later innovations capitalized on its lower costs.*"

[92] According to Merton (1989), financial intermediaries play an important role in the presence of transaction costs as they permit economic agents facing transaction costs to achieve the desired risk-return profile. Concerning securitization, Hill (1996) suggests that the issuance of asset-backed securities allows the reduction of transaction costs. Mandra and Soubra (1991) refer that financial intermediaries maximize their revenues net of marketing costs designing multiple financial products that appeal to a wider set of investors.

[93] As pointed out by Miller (1986), "*[T]he major impulses to successful innovations over the past twenty years have come, I am saddened to have to say, from regulation and taxes.*" Accordingly, Fabozzi et al. (2006) point out that a structured finance transaction is a complex transaction employed by banks, other financial institutions, and corporations as a source of funding and/or favorable capital, tax, and accounting treatment. In the same line of reasoning, Davis (2005) emphasizes the rolling of structured finance in enabling financial institutions to exploit regulatory capital arbitrage (e.g., through securitization).

[94] Kane (1986) presents the 'regulatory dialectic' – innovation as a response to regulatory constrains and regulation as a reaction to the new innovations – as a major source of innovation. Bank capital requirements are a good example. As pointed out by Jones (2000) when referring to securitization, "... *this method is used routinely to lower the effective risk-based capital requirements against certain portfolios to levels well below the Basel Capital Accord`s nominal 8% total risk-based capital standard*." The same idea is presented by Hill (1996) and Alles (2001).

(1997), and Frame and White (2004)],[95] *increasing globalization and managing risks* [e.g., Smith et al. (1990), and Tufano (2003)],[96] or *taking advantage of technological shocks* [e.g., Campbell (1988), White (2000), Tufano (2003), and Frame and White (2004)].[97] Consequently, it is important to stress that the financial innovation process is dynamic, as one innovation begets the next – characterized by Merton (1992) as the 'financial innovation spiral'.[98]

Based on Campbell (1988), Frame and White (2004) suggest a list of economic / environmental factors favoring financial innovation. In addition to the previously mentioned economic advantages of financial innovation, Frame and White (2004) point out macroeconomic conditions – unstable macroeconomic conditions "*... create uncertainties and risks and thus are likely to spur more innovation than would be true in a stable macroeconomic environment.*" Based on empirical work, Frame and White (2004) conclude that: (i) regulation drives financial innovation; (ii) the size of banks is positively related with the adoption and diffusion of new technologies; (iii) investors' degree of education and income is positively related with the use of new financial technologies; (iv) financial innovators are compensated for their efforts – there appears

[95] A good example of a tax induced financial innovation is structured leasing. According to Arzac (2005), this type of structured finance transaction can "*... generate governable tax benefits, with a different sequence and structure than is achieved by depreciating the asset and covering attendant financial costs arising from the funding policy adopted to purchase the asset…*" Caselli (2005) argues that the benefit from a structured leasing transaction is much more significant when tax benefits are greater and more flexible than those obtained by depreciating the underlying asset. For further discussion of structured leasing see Annex 3.

[96] Smith et al. (1990) show that increased volatility (increase in riskiness) stimulates financial innovation. The increase in the volatility of interest rates, exchange rates, and commodity prices provides the impetus for financial innovation. The same idea is presented by Tufano (2003): innovation helps firms, investors and even governments to manage new risks (exchange rates risks, interest rate risks and political risks) that arise with higher globalization.

[97] Advances in technology can explain the timing of some innovations. Tufano (2003) argues that advances in information technology support sophisticated pooling schemes observed in securitization. White (2000) points out that information technology and improvements in telecommunications have facilitated a number of innovations (e.g., new methods of underwriting securities, new methods of assembling portfolios of stocks, new markets for securities, and new means of executing security transactions). According to Frame and White (2004), the development of technologies like telecommunications and data processing allows financial-market participants to measure and manage their risk exposures more efficiently and effectively.

[98] Merton (1995) argues that the financial-innovation spiral pushes the financial system toward an idealized target of full efficiency. That is, as new products become standardized and move from financial intermediaries to markets, "*... the proliferation of new trading markets in those instruments makes feasible the creation of new custom-designed financial products that improve 'market completeness'.*" Success of products encourages the creation of new products and strategies and the spiral works toward the situation of a (theoretically) zero marginal transaction cost and the markets become complete.

to be first-mover advantages;[99] and (v) the welfare effects of financial innovation appear to be positive.

According to Duffie and Rahi (1995), "*[F]inancial securities are designed to suit many motives*". They argue that the design of new securities is frequently motivated by new regulation, changes in fiscal or monetary policies, or adjustments in accounting standards or tax codes. Allen and Gale (1994) and Duffie and Rahi (1995) survey the literature on the role of innovation in completing and spanning markets. Considering the spanning role of securities and the interaction between spanning and asymmetric information, the authors reach two major conclusions: (i) from a spanning point of view, "*... we can guess that there are incentives to set up markets for securities for which there are no close substitutes, and which may be used to hedge substantive risks*"; and (ii) given the potential for adverse selection, "*... we would expect issuers of securities to consider the impact of private information on the design of their securities.*"

Some authors present the advances in the theory of finance as an important factor promoting changes in the structure of the financial system and leading to financial innovations.[100] Considering the investor perspective, Carow et al. (1999) argue that firms issue new securities to accomplish certain risk-return profiles desired by investors, or to replicate investment strategies available but at a lower cost.

Nevertheless, there is no consensus amongst authors regarding the net impact of financial innovation on society. Merton (1992) believes in a net positive impact, stating that "*[F]inancial innovation is viewed as the 'engine' driving the financial system towards its goal of improving the performance of what economists call the 'real economy'.*" He gives the example of the U.S. national mortgage market and the development of international markets for financial derivatives.[101] However, other authors argue that financial innovation has a net negative impact on society. As pointed out by Tufano (2003), their arguments are based on the costs of innovation that postpone taxation, give rise to loss of tax revenues, introduce a sense of inequity, add a

[99] Duffie and Rahi (1995) also argue that there is a first-mover advantage in the process of innovation.
[100] See, e.g., Bernstein (1992) for a description of the interplay between theory and practice in bringing about some of the major innovations of the last decades.
[101] In 1995, Merton also states that "*[I]nnovation in financial intermediation improves efficiency by completing markets, lowering transaction costs, and reducing agency costs.*"

higher degree of complexity that leads to bad business decisions and social costs, and generate a high degree of market volatility. On the contrary, Frame and White (2004) declare that "*[O]ur review of the empirical literature shows that the findings are largely positive, especially for product and process innovations.*" Considering financial innovations as both the introduction of new assets and the integration of segmented markets, Acharya and Bisin (2005) show that financial innovations are socially desirable when: (i) they generate a higher level of risk-sharing, and (ii) given the backdrop of a segmented assets market in integrating economies, there is coordination between financial intermediaries in the innovation process.

Finally, Gennaioli et al. (2010) present a mixed perspective on this subject. Despite recognizing the benefits of financial innovation, they "*... take a more skeptical view about the social value of liquidity creation when investors neglect certain risks. In such a system, security issuance can be excessive and lead to fragility and welfare losses, even on the absence of leverage.*"

2.4.3 Financial Innovators

Several studies attempt to answer the following question: *who innovates?* Ross (1988) refers to investment banks as institutions playing a key role in the financial innovation process. They maximize their profits by coming up with innovative securities with the goal of lowering marketing or search costs. Boot and Thakor (1997) focus on the design of financial systems[102] and conclude that innovation would be lower in a universal banking system (e.g., the German system) than in a financial system with functionally separated banking (e.g., the U.S. system, where commercial and investment banking are functionally separated).[103] Bhattacharyya and Nanda (2000) study the incentives of investment banks to innovate. They find that banks with larger market shares tend to innovate and smaller banks are likely to share innovations with the larger ones.[104]

[102] For further discussion of financial system design topic see, e.g., Allen (1992) and Allen and Gale (1995).
[103] According to Boot and Thakor (1997), universal banks have less incentive to innovate than specialized banks due to spillover effects. "*This provides one perspective on the higher rate of financial innovation in the U.S. relative to Europe.*"
[104] As pointed out by Bhattacharyya and Nanda (2000), "*[I]nnovation incentives increase in volatile environments and regulatory scrutiny actually encourages loophole exploitation activity.*" They show that the larger the market share the greater the investment bank incentives are to engage in innovative activity.

Tufano (1989) studies the benefits accruing to financial innovation and concludes that "*... innovators earn higher market shares than followers, even though imitation is rapid.*" Carrow (1999) achieves similar results but finds, contrary to Tufano (1989), that underwriting spreads decline as the number of followers increases. When considering the role of the issuers in financial innovation, Tufano (2003) argues that larger and well-established firms have a leading role in innovation, while smaller and weaker firms face a greater number of constraints.

2.4.4 Security Innovation Models

There are several equilibrium models of financial innovation. Next, we will present the main results of the most prominent ones. Duffie and Rahi (1995) present two central stages in security innovation models: (i) "*[G]iven the innovated securities and those already present, the determination of equilibrium prices and allocations*"; and (ii) "*[G]iven the correspondence mapping the securities to be chosen for innovation to the resulting set of security market equilibria, optimization by one or more innovators.*" A major difficulty in developing such models is the determination of a reasonable and tractable model for security market equilibrium – a considerable number of financial innovation models leads to a situation with non-existing equilibrium, except for situations in which innovations lead automatically to complete markets.

Elul (1995) studies the welfare effects of financial innovation in incomplete markets and shows that the introduction of a new security may have "*... almost arbitrary effects on agents' utilities.*" Dow (1998) presents the same idea declaring that "*... opening a new market may make everybody worse off, even when the new security is in equilibrium.*"[105] Allen and Gale (1989, 1991, and 1994) analyze the impact of short sales restrictions on social welfare. They argue that, in asset securitization, these restrictions can provide arbitrage value because two portfolios of securities paying the

[105] Dow (1998) uses standard finance models of trading with informational asymmetry [e.g., Kyle (1985) and Glosten and Molgrom (1985)] to study the value of financial innovation and analyze the welfare effect of adding a new security. Both arbitrageurs and hedgers can be worse off because the liquidity of the old market reduces as risk-averse arbitrageurs use new market to hedge their positions in the preexistent market. However, a major limitation of the model can be pointed out: production and investment decisions do not consider the effect of security prices.

same amount may have different prices.[106] Along the same line of Allen and Gale, Chen (1995) argues that with short sale restrictions innovation may be profitable because it can reduce the cost of market frictions.[107] Pesendorfer (1995) presents a model in which financial intermediaries can issue new securities collateralized by a portfolio of standard securities and by portfolios of securities innovated by other intermediaries. The author shows that there is no incentive in equilibrium to introduce new securities (securities that have not already been introduced).[108]

Gennaioli et al. (2010) developed a model with a structure similar to traditional models of innovation [Ross (1976) and Allen and Gale (1994)], considering that investors and intermediaries do not attend to some risks, and have a preferred habitat for specific (namely safe) assets. They obtain three main results: (i) there is space for financial innovation, but when some risks are neglected, the new securities are over-issued; (ii) markets for new securities are fragile;[109] and (iii) in equilibrium, intermediaries buy back many of the new securities and prices will fall sharply as a result of the over-issuance of new securities.[110]

2.5. Financial Innovation and Structured Finance

"*An important question concerns how such securities should be optimally designed; in other words, how should the payoffs to a security be allocated across states of nature in order to maximize the amount the issuer receives?*"

Allen and Gale (1989)

[106] Considering the Allen and Gale articles together, results are disconfirming: in their 1989 paper, they show that innovation is efficient and may enhance social welfare (when considering that short selling is severely limited); however, in their 1991 article, they find that financial innovation is not necessarily efficient (assuming the environment in which the set of traded securities is endogenous and investors are permitted to undertake unlimited short sales).

[107] Chen (1995) developed a model based on intermediaries that create new securities collateralized by old ones.

[108] Pesendorfer (1995) bases his/her work on a notion of equilibrium similar to that presented by Allen and Gale (1989, 1991, and 1994); i.e., all consumers and intermediaries optimize, and markets clear.

[109] When additional news about unattended risks catches investors and intermediaries by surprise, investors dump the 'false substitutes' and fly to the safety of traditional securities.

[110] The model fits well the international financial crises that started in the second half of 2007.

A considerable number of new financial products have been brought to financial markets recently. Thus, an important question concerns: *why the design of new securities or products matters?* The results of Modigliani and Miller (1958) and of subsequent authors[111] that, under a specific set of restrictive and artificial assumptions – when markets are complete – the capital structure decision of firm was irrelevant to its market valuation, suggests that the design of securities issued in this case is also irrelevant. However, the result that capital structure effectively matters in a world where market frictions and imperfections are present indicates that the design of securities may also be important.[112] This throws light on the optimal design of securities and on the development of structured finance products.[113] In academia, models such as that of Allen and Gale (1989) suggest that successful structured finance products allocate cash flows to the investors who value them the most, allowing securities to be held in their most valuable form. Thus, structured finance research needs to focus on market imperfections to understand the design of structured finance transactions.

The profusion of new products and securities introduced in financial markets in recent years has been attributed to a variety of causes: regulation, changes in fiscal or monetary policies, adjustments in accounting standards or tax codes, and volatility in interest rates, among others. Finnerty (1988) presents deregulation of the financial services industry and increased competition within investment banks as important causes to financial innovation. Investment banking institutions play an important role in the development and introduction of innovative products.[114] One of the main activities of these institutions is the search for opportunities to create new financial instruments.

[111] Such as Stiglitz (1969, 1974), Baron (1974, 1976), and Hellwig (1981).

[112] Allen and Gale (1989) developed a model of security design in which they explicitly incorporate the transaction costs of issuing securities and conclude that "*... Modigliani and Miller's (1958) irrelevance result does not hold: the value of firms has to depend on their financial structure to give them incentive to issue costly securities.*" Harris and Raviv (1989) state that security design is a tool for resolving conflict of interest between contestants for control and outside investors and for maximizing firm value.

[113] Cherubini and Della Lunga (2007) argue that "*[S]tructured Finance denotes the art (and science) of designing financial products to satisfy the different needs of investors and borrowers as closely as possible*."

[114] In an Arrow-Debreu world with complete markets and complete information, financial intermediaries would not have space. However, in today's world there are numerous reasons why the investment opportunities offered by financial markets are incomplete, in particular: (i) complexity – the market provides only simple contracts; (ii) liquidity – a limited set of securities is usually observed; (iii) legal uncertainty – preference for securities on which there is a settled body of case law; and (iv) gains from standardization – higher volume of trading in standard securities.

By combining a set of already existing components, it is possible to satisfy some special needs of specific groups of investors. As referred by Breuer and Perst (2007),[115] "… *this process is called 'financial engineering', as investment bankers act similarly to engineers or natural scientists when planning and creating complex financial innovations, on the basis of some elementary building blocks, in order to meet their customers' needs.*" According to Finnerty (1988), financial engineering is the 'lifeblood' of financial innovation activity.[116]

Duffie and Rahi (1995) present the same idea saying that "*[T]he innovator, often as investment bank, usually acts as an intermediary.*" Investment banks also innovate through their underwriting activities, acting as design and pricing consultants to firms willing to issue a new financial instrument or product. The authors point out the creation of asset-backed securities – such as collateralized mortgage obligations (CMOs) – as a major example of financial innovation.[117]

In his 1989 work, Tufano developed an empirical study about the advantages of financial innovation for investment banks. As patent or copyright protection is difficult to obtain for financial products, Tufano argues that by innovating, an investment bank expects to capture a higher share in the underwriters market.[118] Through innovation, an investment bank obtains expertise and reputation, factors that give first-mover advantages to these institutions.[119] But when a new and complex security is designed,

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[115] Breuer and Perst (2007) apply the cumulative prospect theory, in combination with arbitrage theory, to price and evaluate Discount Reverse Convertibles (DRCs) and Reverse Convertible Bonds (RCBs) as examples of structured products.

[116] Investment banks face strong financial incentive for engineering innovative securities or products because the development of a new product provides an opportunity to solicit business from clients that have traditionally worked with other investment banks.

[117] Caselli and Gatti (2005) present securitization (in addition to project finance, structured leases, and acquisition finance activities, supported on a strong debt component – mostly leveraged buyouts) as a type of structured finance. As asserted by Roever and Fabozzi (2003) "*... securitization is a form of financing where monetary assets with predictable cash flows are pooled and sold to a specially created third party that has borrowed money to finance the purchase. These borrowed funds are raised through the sale of asset-backed securities (ABS), which can take the form of either commercial paper or bonds*." For further discussion of securitization and asset-backed securities see Annex 1.

[118] The incentive to innovate is reduced unless an innovator can prevent competitors from freely imitating its innovations. Such problems can be acute for financial innovations because the costs of security innovation – product development, marketing, and legal expenses – can be substantial. Therefore, investment banks may have a limited first-mover advantage before rival banks can offer similar products.

[119] According to Duffie and Rahi (1995), this expertise "*... includes the ability to exploit the properties of the financial product to the benefit of the issuer (for example, obtaining the most efficient tax shield if the product is designed for tax avoidance), the ability to price the product in the market accurately, and knowledge of the market of potential investors in the product.*"

the investment bank has to have the ability to convince an issuer (or investor) that it would receive (or pay) a fair value for that security. Otherwise, it will be difficult for the security to reach the market.[120] Moreover, the financial innovation impact depends on the level of financial market sophistication. For example, the introduction of a new structured product is likely to be less successful in an underdeveloped financial market than in a more developed and sophisticated financial market.

Finnerty (1988) argues that one of the financial engineering branches involves the creation of solutions to corporate finance problems, "*... such as the design of customized security arrangements for a project finance or leveraged buyout* […] *those involved in various forms of asset-based financing.*"[121] Thus, Structured Finance products are commonly mentioned as one group of newly introduced instruments resulting from financial innovation activities.

The success of structured products depends on the trade-off between the costs for the issuer and the benefits they offer to investors.[122] Therefore, they have to offer issuing company's shareholders real value added for being so popular. Based on Finnerty's (1988) work about securities innovation, we can point out some sources of value that can be added by structured finance transactions: (i) risk reallocation / yield reduction – risks are transferred from those who are less willing to bear it to those who are more willing to bear it and, therefore, they require a smaller yield premium [e.g., collateralized mortgage obligations (CMOs) and stripped mortgage-backed securities]; (ii) reduced agency costs – the capital structure must be engineered to satisfy the risk-return preferences of the various classes of investors and to minimize potential agency costs (e.g., project finance and leveraged buyouts); (iii) reduced issuance costs (e.g., securitization); and (iv) tax arbitrage (e.g., structured leases).

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[120] Bearing in mind the model of security standardization developed by Gale (1992), we can argue that there may be an aversion to complexity in security design related to the costs associated with the analysis of complex securities.

[121] Finnerty (1988) points out that financial engineering "*... involves the design, the development, and the implementation of innovative financial instruments and processes, and the formulation of creative solutions to problems in finance.*" The author gives leveraged buyout structuring, corporate restructuring, and project finance/lease/asset-based financial structuring as prominent examples.

[122] Investment banks typically calculate the costs of creating a new structured product supported on arbitrage-theoretical tools for perfect capital markets. The evaluation of investor's potential utility gains requires one to abstract from a perfect capital market as customers do not have the same market assessment as investment banks do. See Breuer and Perst (2007) for further discussion of this subject.

Additionally, the demand for tailored products, like structured finance products is encouraged by the increase of delay costs faced by firms. As explained by Bhattacharyya and Nanda (2000), "*... banks will tend to pursue innovation opportunities in areas where clients face greater costs of delay.*" Structured finance is often used if the established forms of external finance are unavailable for a particular financing need, or traditional sources of funding are too expensive, circumstances where firms may face higher delay costs.

As previously noted, with the discussion of the security design and financial innovation theory it is primarily aimed to put into perspective some of the theoretical foundations of the firms' decision to select structured finance instruments and products as a component of its strategic financing decision. One of the unsatisfactory aspects of corporate finance theory is its inability to explain why firms decide to obtain funding via structured finance instruments and products *vis-a-vis* straight debt financing. In Chapter 3, we discuss the literature of structured finance, which is the theoretical framework that enabled the formulation of the testable hypotheses.

3. Review of Structured Finance Literature

3.1. Introduction

The literature on structured finance is scarce when compared to other fields of corporate finance. Only a small number of academic and professional (financial intermediaries as principal actors in the market) studies can be found, which systematically address structured finance. Taking into consideration that structured finance is a business area that encompasses a wide range of transactions, we decided to include securitization, project finance, structured leasing and leveraged acquisitions[123] under the classification of structured finance transactions. This perimeter of analysis was built based on existing literature, as well as on the observation of the transactions undertaken by the intermediaries competing for this business area (section 3.2 explains this choice).

Going through the existing literature, a set of relevant papers can be found on the subject of structured finance.[124] In the following sections, we discuss structured finance literature based on the central economic benefits as well as on the major problems related to the use of these financing instruments. Considering that structured finance, more specifically asset securitization, played a relevant role in the development and propagation of the 2007/2008 financial crisis, we dedicate a specific section to this issue. Our goal is to review the most influential theoretical papers, summarize their results, present their relationship to each other, and associate them with the existing empirical evidence. Furthermore, grouping prominent papers in this manner enables us to exam the relationships among similar key economic benefits and disadvantages of different structured finance transactions.

With the purpose of achieving an analysis as clear and extensive as possible, and also to put into perspective the approach to the problem adopted in this study, the extant literature has been classified according to the major group of categorization and to the type of structured finance transaction we are analyzing. Such classification is

[123] Leveraged Acquisitions are acquisition finance activities conducted by utilizing a deal based on a strong debt component. Considering that LBOs are the most widespread category of such transactions, from now on we will use indistinctly throughout the dissertation Leveraged Acquisitions and LBOs.

[124] Literature review is carried out based not only on structured finance literature but also on the most prominent papers on each type of operations identified as examples of structured finance transactions; i.e., securitization, project finance, structured leasing, and leveraged acquisitions.

summarized in Table 3.1 and will be closely followed in the next sections (the numbering in the table matches that of the following sections of this chapter).

Each of these major groups is discussed in a separate section, despite the fact that many of the papers would fit well in more than one group. In each group we build on previous research, review the most influential theoretical papers and attempt to interweave them in a manner that produces a coherent picture of the structured finance theory as it is presented today. Annex 5 shows a summary of relevant literature on structured finance by presenting a table in which we build up a relationship between reviewed studies and key theoretical elements of structured finance transactions; i.e., (1) operational and informational efficiency; (2) asymmetric information; (3) capital structure; (4) tax, legal and regulatory issues; (5) agency problems; and (6) motivations for using structured finance.

This chapter has four sections. The first section introduces the main purpose of this chapter. Section two gives a perspective on the existing definitions of structured finance. Additionally, we contribute to a systematic definition of structured finance. The third section outlines the economic motivations for structured finance transactions. Next, we present some problems related to the use of structured finance. Finally, we examine the influence of structured finance transactions in the development and propagation of financial crises, especially the 2007/2008 financial turmoil.

Major Group	Elements of Structured Finance	Type of Structured Finance Transaction
3.2. Definition of Structured Finance	3.2.1. Existing Definitions of Structured Finance	
	3.2.2. A Contribution to the Definition of Structured Finance	
3.3. Motivations for Using Structured Finance	3.3.1. Source of Liquidity and Funding Diversification	Securitization (3.3.1.1.) | Structured Leasing (3.3.1.2.)
	3.3.2. Reduction of Funding Costs	Securitization (3.3.2.1.) | Project Finance (3.3.2.2.) | Structured Leasing (3.3.2.3.)
	3.3.3. Improved Efficiency	Securitization (3.3.3.1.) | LBOs (3.3.3.2.)
	3.3.4. Reduction of Agency Costs	Project Finance (3.3.4.1.) | LBOs (3.3.4.2.) | Securitization (3.3.4.3.)
	3.3.5. Reduction of Information Asymmetries	Securitization (3.3.5.1.) | Project Finance (3.3.5.2.) | LBOs (3.3.5.3)
	3.3.6. Higher Leverage and Tax Shields/Savings	Project Finance (3.3.6.1.) | LBOs (3.3.6.2.) | Securitization (3.3.6.3.) | Structured Leasing (3.3.6.4.)
	3.3.7. Improve/Preserve Financial and Regulatory Ratios	Project Finance (3.3.7.1.) | Securitization (3.3.7.2.) | Structured Leasing (3.3.7.3.)
	3.3.8. Risk Management	Securitization (3.3.8.1.) | Project Finance (3.3.8.2.) | Structured Leasing (3.3.8.3.)
	3.3.9. Financial Flexibility	Project Finance (3.3.9.1) | Structured Leasing (3.3.9.2.) | Securitization (3.3.9.3.)
3.4. Problems Related to the Use of Structured Finance	3.4.1. Complexity	Securitization | Project Finance | LBOs | Structured Leasing
	3.4.2. Off-Balance Sheet Treatment	Securitization | Project Finance | Structured Leasing
	3.4.3. Asymmetric Information Problems	Securitization | LBOs
	3.4.4. Agency Problems	Securitization
	3.4.5. Higher Transaction Costs	Securitization | Project Finance | LBOs | Structured Leasing
	3.4.6. Wealth Expropriation	LBOs | Structured Leasing
3.5. Structured Finance and Financial Crises	3.5.1. Financial Crises	
	3.5.2. Structured Finance and The Subprime Financial Crisis	
	3.5.3. Concluding Remarks	

Table 3.1: Review of Structured Finance literature

3.2. Definition of Structured Finance

3.2.1 Existing Definitions of Structured Finance

Davis (2005) argues that "*... the definition of structured finance is broad, and not everyone agrees on exactly what it is.*"[125] Defining the boundaries of such a structure is not fully consensual, especially among financial intermediaries in this area of business.[126] Correspondingly, Criado and Rixtel (2008) state that structured finance "*... relates to a group of complex instruments and mechanisms that defers simple universal definition…*"

Relying on a broad definition, Fabozzi et al. (2006) define structured finance as "*... techniques employed whenever the requirements of the originator or owner of an asset, be they concerned with funding, liquidity, risk transfer, or other need, cannot be met by an existing, off-the-shelf product or instrument. Hence, to meet this requirement, existing products and techniques must be engineering into a tailor-made product or process. Thus, structured finance is a flexible financial engineering tool.*"[127] According to Jobst (2007), "*[S]tructured finance encompasses all advanced private and public financial arrangements that serve to efficiently refinance and hedge any profitable economic activity beyond the scope of conventional forms of on-balance sheet securities (debt, bonds, equity) at lower capital cost and agency costs from market impediments on liquidity*". Similarly to Jobst (2007), Tavakoli (2008) asserts that "*[S]tructured finance is a generic term referring to financings more complicated than traditional loans, generic bonds, and common equity.*" Cherubini and Della Lunga (2007) argue that "*[S]tructured Finance denotes the art (and science) of designing financial products*

[125] Davis (2005) implements a survey which asks some of the expert contributors to the *Journal of Structured Finance* two basic questions (Questionnaires were sent to 53 people and 27 responses were received): (1) 'What is your definition of structured finance?'; 'Where do you think the boundaries are?'. As pointed out by Fabozzi et al. (2006), "*[I]t is apparent from the survey that 'structured finance' covers a wide range of activity in the market.*"

[126] Davis (2005) also presents some difficulties related to the definition of structured finance: (i) in structured finance business, the "*... very hard-to-define attribute may help preserve its creativity, vibrancy, and flexibility and generally contribute to the success of structured finance…*"; and (ii) that the field of finance is dynamic and "*… what was complex and structured today may become 'plain-vanilla' and standard tomorrow.*"

[127] According to Fabozzi et al. (2006) this is "*... a good working definition for structured finance* [though] *there are alternative definitions…*" See their work for some additional definitions proposed by practitioners and regulators. They conclude by stating that "*... it is probably best to say that there is no one definition of structured finance, and that the term can be used to describe any financial transaction that is not plain vanilla.*"

to satisfy the different needs of investors and borrowers as closely as possible". Coinciding with Jobst (2007) and Cherubini and Della Lunga (2007), Fabozzi and Kothari (2007) present a structured finance transaction as a financing solution or product that is structured to achieve certain purposes and needs.

According to Caselli and Gatti (2005) asset securitization, project finance, structured lease and acquisition finance activities, supported by a strong debt component (mostly leveraged buyouts – LBOs), are the formats of structured finance.[128] Based on a survey of experts on the definition of structured finance, Fabozzi et al. (2006) point out that structured finance should include securitization, leasing, project finance, and other 'unusual complex financing transactions'.[129] Building on the characteristics of such transactions, Akbiyikli et al. (2006) argue that "*[A] structured financial transaction is any transaction that makes use of an SPV.*"[130]

Servigny and Jobst (2007) advocate a restricted view of structured finance, referring only to securitization.[131] This point is well illustrated in Oldfield (1997) who notes that a structured finance transaction "... *has three parts. The first is collateral to back the transaction. The second is an entity to house the transaction, and the third is a set of financial instruments issued by the entity to fund the transaction*".[132] Coval et al. (2009) offer a similar definition. Essentially, structured finance activities are based on "... *the pooling of economic assets like loans, bonds, and mortgages, and the subsequent issuance of a prioritized capital structure of claims, known as tranches, against these collateral pools.*"

[128] As pointed out by Caselli and Gatti (2005), "*[T]his perimeter of analysis does not lend itself to meticulous theoretical or empirical debate. The evidence which emerges from observation of the managerial practices of international and domestic intermediaries that compete in this business* […] *substantially confirms this choice.*"

[129] The survey was primarily implemented by Davis (2005).

[130] Similarly, Kavanagh (2003) asserts that structured finance generally requires participation from inception of more than one entity and has its origins in two different phenomenons which occurred in the 1970s: securitization and the use of special purpose vehicles (SPVs).

[131] Contrastingly, Fabozzi et al. (2006) suggest that "*...our view is that securitization is a subset of structured finance*."

[132] Similarly, the Committee on the Global Financial System (2005) defines structured finance based on "*... three key characteristics: (1) pooling of assets (either cash-based or synthetically created); (2) tranching of liabilities that are backed by the asset pool (this property differentiates structured finance from traditional "pass-through" securitisations); (3) de-linking of the credit risk of the collateral asset pool from the credit risk of the originator, usually through use of a finite-lived, standalone special purpose vehicle (SPV).*" A similar perception is presented by Rajan and McDermott (2007) and Krebsz (2011).

As it becomes clear from the above, some authors strongly interrelate structured finance with securitization. For example, according to Oldfield (1997), structured finance, in a narrow sense, is used almost interchangeably with securitization. In the present dissertation, we will use a wide definition of structured finance.[133] Additionally, there are different opinions as to whether we should categorize derivatives – such as interest rate, currency and credit – as structured finance. Although some derivatives are highly structured products, we consider derivatives to be elements that allow certain plain vanilla products to become structured. This argument is supported by Fabozzi et al. (2006) who states that "*[W]hile an interest rate derivative contract does not in itself constitute structured finance, the use of derivatives is one of the features that distinguish large structured financings.*" Thus, considering the existing literature one can identify the following types of structured finance:

i. Securitization.[134] [135]
ii. Project finance.[136] [137]

[133] Our view is similar to that of Fabozzi et al. (2006), who assert that "*[C]learly structured finance encompasses more than simply securitization, although that is a popular definition for it.*" Tavakoli (2008) presents the same line of reasoning as well as Roever and Fabozzi (2003), who state that "*[S]tructured Finance also encompasses project finance, some types of equipment and cross-border finance, and some other kinds of secured financing.*"

[134] According to Cumming (1987), "*… perhaps the best definition of securitization is the matching up of borrowers and savers wholly or partly by way of financial markets. Such a definition covers issuance of securities such as bonds and commercial paper – a practice that entirely replaces traditional financial intermediation – and also sales of mortgage-backed and other asset-backed securities – transactions that rely on financial intermediaries to originate loans but use the financial markets to seek the final holders.*" As asserted by Roever and Fabozzi (2003) "*… securitization is a form of financing where monetary assets with predictable cash flows are pooled and sold to a specially created third party that has borrowed money to finance the purchase. These borrowed funds are raised through the sale of asset-backed securities (ABS), which can take the form of either commercial paper or bonds*". Securitization can be implemented basically in two ways [ECB (2008)]: (i) in a so-called true sale securitization, the underlying assets are sold by the originator (a firm or more specifically a bank) to the SPV and thus removed from its balance sheet; (ii) in a so-called synthetic securitization, the underlying assets remain on the balance sheet of the originator, and only risk of the underlying assets is transferred to the SPV by buying credit derivatives such as credit default swaps over these assets. Securitization products generally are viewed as including Asset-Backed Securities (ABS), Residential Mortgage-Backed Securities (RMBS), Commercial Mortgage-Backed Securities (CMBS), Collateralized Debt Obligations (CDOs), and Asset-Backed Commercial Paper (ABCP). See Annex 1 for an overview of securitization instruments.

[135] See, for example, Roever and Fabozzi (2003), Davidson et al. (2003), Tavakoli (2003, 2008), Tasca and Zambelli (2005), Kothari (2006), Jobst (2007), and Krebsz (2011) who explain the structure of securitization transactions.

[136] Esty (2004a) argues that a project finance transaction "*… involves the creation of a legally independent project company financed with nonrecourse debt (and equity from one or more sponsors) for the purpose of financing a single purpose, industrial asset.*" Gatti (2008) points out that project finance "*… is the structured financing of a specific economic entity – the SPV, or special-purpose vehicle, also known as the project company – created by sponsors using equity or mezzanine debt and for which the*

iii. Structured leasing.[138] [139]

iv. Leveraged Acquisitions[140] [through particular focus on Leveraged Buy-Outs (LBOs), the most common category of such a transaction].[141] [142]

v. Structured Credit.[143]

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lender considers cash flows as being the primary source of loan reimbursement, whereas assets represent only collateral." See Annex 2 for a review of project finance.

[137] See, for example, Brealey, Cooper, and Habib (1996), Kleimeier and Megginson (2000), Esty (2004a, 2004b, 2007), Gatti (2005), Blanc-Brude and Strange (2007), and Gatti (2008) for further discussion of this topic.

[138] Used in particular transactions involving complex and large-scale assets, such as airplanes, ships, industrial plant and equipment, and large real estate projects, a structured leasing transaction can fall within one of the following two categories: (1) leveraged transactions (mainly cross-border leasing with a trust); and (2) synthetic leasing. A structured leasing is understood as a transaction that develops synergies between funding policy, risk management of the underlying assets and tax benefits. With these types of transactions, the sponsor aims to manage the need for funding in a creative manner, as opposed to just raising funds by means of recourse to the leasing instrument. Thus, structured leasing is a highly flexible tool. As pointed out by Caselli (2005), structured leasings, "*... inasmuch as a leasing transaction can: (i) enable contract terms to be modulated in relation to the lessee's cash flow structure; (ii) generate governable tax benefits, with a different sequence and structure than is achieved by depreciating the asset and covering attendant financial costs arising from the funding policy adopted to purchase the asset; (iii) finance the possible call option at the end of the leasing transaction*." See Annex 3 for an overview of structured leasing.

[139] See Carretta and De Laurentis (1998) for a review of leasing transactions. For a comprehensive account of theoretical and empirical literature on structured leasing see, among others, Braund (1989), Slovin et al. (1990), Fowkes (2000), Caselli (2005), Fabozzi et al. (2006), and Deo (2009).

[140] Capizzi (2005) asserts that "*... in accordance with operative approach characterizing the most important local and global investment banks, leveraged acquisitions have been placed within the area of structured finance.*" He argues that "*... leverage acquisitions constitute an important category in the area of structured finance, namely those that result in leaving the acquired company with a debt ratio that is higher than what it was before the acquisition."* With regard to the literature and the business area of structured finance, the following types of leveraged acquisitions can be identified: (1) Leveraged Buy-Out (LBO); (2) Management Buy-Out (MBO); (3) Management Buy-In (MBI); (4) Buy-In Management Buy-Out (BIMBO); (5) Family Buy-Out (FBO); (6) Workers Buy-Out (WBO); (7) Corporate Buy-Out (CBO); and (8) Fiscal Buy- Out (FBO).

[141] In a Leveraged Buy-Out (LBO) transaction, a group of investors finance the acquisition of a corporation or division mainly by borrowing against the target's future cash flow. According to Rosenbaum and Pearl (2009), "*[A] leveraged buyout (LBO) is the acquisition of a company, division, business, or collection of assets ("target") using debt to finance a large portion of the purchase price. The remaining portion of the purchase price is funded with an equity contribution by a financial sponsor ("sponsor"). LBOs are used by sponsors to acquire a broad range of businesses, including both public and private companies, as well as their divisions and subsidiaries.*" Arzac (2005) argues that "*...the buyout is organized and effected by the promoters, which include a sponsor and, often, existing management as well […] The sponsor is usually an LBO equity fund or the Merchant-banking arm of a financial institution. It provides the core equity and effectively controls the acquisition*". Focusing on the LBO equity contribution, Kaplan and Strömberg (2009) assert that "*[T]he leveraged buyout investment firms today refer to themselves (and are generally referred to) as private equity firms.*" See Annex 4 for a review of leveraged acquisitions and LBOs.

[142] See, among others, Weston et al. (2001), Arzac (2005), Capizzi (2005), Ronneboog and Simons (2005), Rosenbaum and Pearl (2009), Kaplan and Strömberg (2009), and Guo et al. (2011).

[143] Essentially financing products with structured coupons and / or linked derivatives; e.g., loans with embedded derivatives and even relatively complex transactions that lower corporations' funding costs by converting floating rate obligations to fixed rated obligations (or the opposite) through the use of interest rate swaps. As pointed out by Cherubini and Della Lunga (2007), "*... nowadays, the structured finance terms has been provided with a more specialized meaning, i.e. that of a set of products involving the*

3.2.2 A Contribution to the Definition of Structured Finance

Used by financial and non-financial institutions, structured finance is often adopted when the established forms of external finance are unavailable for a particular financing need or conventional sources of funding are too expensive. Cherubini and Della Lunga (2007) present a similar idea declaring that "*... structured finance product is nowadays constructed to enable someone to do something that could not be done in any other way (or in a cheaper way) under the regulation.*" It is generally used wherever there are reliable cash flow streams across the life span of the loan, which the owner wants to make use of to obtain a sizable cash payment from financing proceeds, in a situation where the owner would like to retain the ownership of, and manage, those cash streams (e.g., cash streams such as proceeds from power purchase agreements, rents from real estate assets, toll revenues, payments of taxes, patent revenues, credit card revenues, and the like) [Davis (2005)].

Structured finance transactions seek to replace capital-market-based financing with credit financing through disintermediation, as well as seek to sponsor financial relationships outside the lending and deposit-taking capabilities of banks. According to Fabozzi et al. (2006), "*... the issuer raises funds by issuing certificates of ownership as pledges against existing or future cash flows from an investment pool of financial assets in a bid to increase the issuer´s liquidity position without increasing the capital base or by selling these reference assets to a special-purpose vehicle, which subsequently issues debt to investors to fund purchase.*"

Fabozzi et al. (2006) point out that one or more of the following elements generally characterize a structured finance transaction: (1) a complex financial transaction which may involve the actual or synthetic transfer of assets or risk exposure in order to achieve certain accounting, regulatory, or tax objectives; (2) a transaction based on a special purpose vehicle (SPV);[144] (3) an asset-backed bond issue; (4) a combination of interest

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presence of derivatives..." Some authors [e.g., Rajan and McDermott (2007)] use the term 'Structured Credit' when referring to Credit-Linked Notes (CLNs) and Collateralized Debt Obligations (CDOs), the so-called cash products; and to credit derivatives, which "*... range from single-name default swaps to indexes like the CDX and iTraxx to custom synthetic CDO tranches.*", the so-called synthetic products. In our work, all CLNs and CDOs are subsets of securitization.

[144] Gorton and Souleles (2005) define Special Purpose Vehicle (SPV), Special Purpose Entity (SPE) or Special Purpose Company (SPC) – employed in this work as synonymous – as "*... a legal entity created by a firm (known as the sponsor or originator) by transferring assets to the SPV, to carry out some*

rate and credit derivatives; (5) a transaction used by banks, other financial institutions, and corporations as a source of funding and/or a favorable capital, tax, and accounting treatment; and (6) disintermediation between banks and other corporations.

According to Caselli and Gatti (2005), the presence of a separate vehicle company (SPV or SPE) is critical when it has to be decided if a transaction can be included in the class of structured finance.[145] They present the following conditions: (1) "*[T]he recipient of the funds raised is a separate entity from the party or parties sponsoring the transaction…*" – this is achieved by creating separate vehicle companies, chosen to take on the initiative and to secure cash receipts and payments which result; (2) "*… all economic consequences generated by the initiative in question are attributed to this SPV…*" – consequently, creditors grant financing to the SPV and not to sponsors or originators; and (3) "*… the assets instrumental to managing the project are separated from the remaining assets of the parties that create the vehicle…*" – thus, both cash flows generated by the initiative and SPV´s assets become collateral for creditors.[146] These three conditions explain why 'off-balance sheet financing' and structured finance are frequently applied as synonymous.[147]

specific purpose or circumscribed activity, or a series of such transactions. SPVs have no purpose other than the transaction(s) for which they were created, and […] *the rules governing them are set down in advance and carefully circumscribe their activities.*" They usually house asset risk either through the purchase of the assets or in a synthetic form. SPVs can have several legal forms; e.g., a limited partnership, a limited liability company, a trust, or a corporation [Kramer (2003)]. Tavakoli (2008) presents SPVs as powerful structured finance tools, which can be either onshore and offshore. See Lancaster et al. (2008) and Tavakoli (2008) for further discussion of 'structured finance and special purpose entities'. See Annex 6 for further discussion of this subject.

[145] This is the reason why they identify securitization, project finance, structured leasing transactions and leveraged acquisitions as examples of structured finance transactions. However, for securitization, we can find transactions that do not use SPVs. For example, up until the 1990s, CDOs all used SPVs that purchased the portfolio of assets and issued securities. The SPV purchased the assets from a bank's balance sheet and/or trading books – the so-called 'true sale' structures. Synthetic securitizations eliminate the need for an SPV entity, albeit they may also use an SPV to issue limited recourse notes linked to a CDO's tranched credit risk.

[146] The creation of a separate entity that raises funding for the implementation of a specific initiative (or project) implies that the loan repayment is guaranteed primarily by the generation of cash flows by the SPV's assets. Since creditors are dealing with no-recourse financing (or limited recourse financing in specific assets), "*[T]he net worth of the sponsors is, in theory, irrelevant in assessing the financial sustainability of the loans…*" [Caselli and Gatti (2005)]. Special purpose entities are often classified as either 'pass-through' structures – they pass all of the principal and interest payments of assets through to investors (are generally passive tax vehicles and do not attract tax at the entity level) – or 'pay-through' structures – they allow for reinvestment of cash flows, and purchase of additional assets.

[147] This idea is corroborated by Gorton and Souleles (2005), who assert that "*[O]ff-balance sheet financing arrangements can take the form of research and development limited partnerships, leasing transactions, or asset securitizations, to name the most prominent.*" Although the terms SPV, SPE and SPC can be used interchangeably, it is important to distinguish between corporate and trust structures.

As we intend to consolidate the various definitions of structured finance in a systematic way, we propose a definition as follows:[148]

> *Structured finance refers to the design of financial products or instruments based on the use of flexible tools to meet, as closely as possible, the requirements of the originator or owner of an asset (or pool of assets) and the needs of investors. Thus, structured finance encompasses all financial arrangements helping to efficiently (re)finance a specified pool of assets beyond the scope of on-balance sheet financing products or instruments.*

In a structured finance transaction, the requirements of the owner of the assets or cash flows refer to liquidity, funding, risk transfer, efficient risk allocation, favorable capital, tax and accounting treatment, or other needs. Instruments are usually designed (e.g., covenants, warrantees, corporate structure, contract, trusts, etc.) to achieve segregation of those assets or cash flows from the originator or sponsor of the transaction. Additionally, credit enhancement mechanisms are implemented (e.g., the use of warrantees to enhance recoveries and tranching to define risk attachment points).

As suggested above, a key feature of structured finance transactions that distinguishes them from other financing arrangements is the presence of a separate vehicle company (SPV or SPE); i.e., the recipient of the raised funds is a separate entity from the party or parties sponsoring the transaction. This separation is achieved by creating vehicle companies (SPVs) designated to take on the initiative and to secure cash receipts and the resulting payments. Additionally, the SPV plays an important role in the segmentation of cash flows and risks in a form proving more attractive for investors, through a process called structuring. Given the crucial role that the SPV plays in structured finance, we will not consider structured credit as a type of structured finance.

While in USA SPEs are often (but not always) set up as trusts for tax reasons, in non-USA venues the SPE is a common corporate structure. SPEs are currently set up in a variety of tax-friendly venues including Delaware, New York, Luxemburg, the Netherlands, the Caymans, the Bahamas, Ireland, Jersey, Guernsey, and Gibraltar. While choice of venue usually revolves around tax issues, other considerations like accounting issues, bank regulatory issues, and other structural issues are also relevant according to the specific structured finance application (see Annex 6 for further discussion).

[148] This definition stems from the literature review, as well as from the evidence which emerges from the observation of the practices of international and domestic intermediaries that compete in structured finance business area.

Leland (2007) shares the same intuition, indicating that "*[S]tructured Finance typically refers to the transfer of a subset of a company's assets (an 'activity') into a bankruptcy-remote corporation or other special purpose vehicle or entity (SPV/SPE). These entities then offer a single class of securities […] or multiple classes of securities…*" Schwarcz (2005) also states that structured finance transactions "*… include securitization, project finance, and similar transactions in which companies originating financial assets, such as accounts receivable, loans, or lease rentals, utilize special-purpose vehicles (SPVs, sometimes referred to interchangeably as special-purposes entities or SPEs) to facilitate the transaction.*"[149]

In brief, the three main specificities of structured finance are: (i) the critical role of the vehicle company; (ii) high level of leverage; and (iii) centrality of prospective cash flow in order to evaluate the feasibility of operation, representing the distinguishing elements of operations such as project financing, structured leasing, securitization and leveraged acquisitions.

3.3. Motivations for Using Structured Finance

This section discusses the main economic forces underlying the creation of structured finance transactions or products. It first presents the economic benefits of structured finance transactions in general. Subsequently, we examine the economic advantages for originators / sponsors of each specific type of structured finance product; i.e., securitization, project finance, leveraged acquisitions (particularly LBOs), and structured leases.

To analyze the motivations for using structured finance instruments, first and foremost it is important to understand why they create value. For that, we have to look into Modigliani and Miller's (1958) capital structure irrelevance preposition, which states

[149] The same idea is presented by Caselli and Gatti (2005), Davis (2005), IMF (2005), Akbiyikli et al. (2006), and Fabozzi et al. (2006). As pointed out by Akbiyikli et al. (2006), a structured finance transaction "*… is any transaction that makes use of an SPV* [which] *is set up for the purpose of allowing firms to sell or divest themselves of particular assets and to raise funds.*"

that firm value does not depend on how a firm finances its investments.[150] Thus, the choice between corporate finance or structured finance to raise funds should be a matter or indifference to shareholders; i.e., in a Modigliani and Miller's world, structured finance would not exist, as it would offer no advantages over less costly alternatives. Modigliani and Miller's theorem is based on the idea that capital markets are perfect. However, as pointed out by Esty (1999) "*[T]he real world, of course, is not perfect by this definition; it contains 'imperfections'. Besides taxes, transactions costs, and costs of financial distress, there are costs stemming from asymmetric information between corporate insiders and outsiders, and from incentive conflicts among managers, shareholders, and creditors.*" Generally, structured finance creates value by minimizing the net costs associated with the stated market imperfections.

Caselli and Gatti (2005) present the advantages of assembling a financing transaction in a structured form by analyzing the difference between two logics of financing: (1) off-balance sheet forms (or structured finance); and (2) on-balance sheet forms (or corporate financing). They argue that "*... the first economic benefit of structured transactions lies in the cost of funding of new financial resources for the initiative. If the benefits of a reduced cost of funding are greater than the cost of the credit enhancement, realizing the initiative on a structured basis is advantageous for sponsors* […] *the second advantage in separating the initiative from the sponsor(s) lies in maintaining financial flexibility of this company or companies.*"[151] The first economic benefit is also presented in a 1995 report entitled 'New Developments in Structured Finance'.[152] In this report, it is indicated that one of the principal benefits from structured financing is a reduction in the cost of financing. Any transaction, which is specifically structured using an SPV and is secured by ring-fencing assets producing

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[150] Modigliani and Miller (1958) showed that, under certain conditions, financial policy does not matter. In particular, under perfectly competitive and complete capital markets and when there are no bankruptcy costs, no taxes, no information asymmetries, and no transaction costs, firm value is independent of its capital structure.

[151] The isolation of an initiative or a pool of assets in a separate vehicle company is intended to isolate the risk of these assets from those of the sponsor or sponsors. Thus, different creditworthiness can be reached by the SPV and the sponsor. As asserted by Caselli and Gatti (2005), "*[O]ne extreme may be strong sponsors and weak initiatives segregated in a vehicle. The other extreme (more commonly found in practice) could be cases where sponsors have rather low creditworthiness but nonetheless are able to make the initiative hinge on a vehicle company which, appropriately secured by credit enhancement mechanisms, can obtain a higher credit rating than its originators.*"

[152] Written by the Committee on Bankruptcy and Corporate Reorganization of the Association of the Bar of the City of New York.

cash flows solely for supporting the transaction, allows the issuer to obtain better credit ratings and/or leverage than it would by issuing senior secured debt. These elements allow the sponsor to achieve lower costs of funding. Akbiyikli et al. (2006) corroborate the second economic benefit presented by Caselli and Gatti (2005). They argue that the purpose of structured finance is to help to preserve its own credit standing and future access to financial markets.

Tavakoli (2008) argues that the key motivations for using structured finance include, among others: (i) reducing funding costs – e.g., in securitization, SPVs can obtain capital at rates better than those obtainable by the originator; (2) changes on the right-hand side of the balance sheet; (3) increasing balance sheet capacity – firms use structured finance vehicles to finance assets used in their business; (4) providing liquidity by transforming illiquid assets into cash; (5) regulatory capital arbitrage;[153] (6) financing assets; and (7) tax management. Similarly, Lancaster et al. (2008) argue that structured finance has played a critical role in improving the efficiency, liquidity, and availability of capital around the world. Additionally, they also present borrowing costs reduction, greater and more diverse investment opportunities, financial synergies,[154] and risk distribution as some important benefits of structured finance.

In summary, the issuance of multiple debt security classes (tranching), the access to new sources of funding, the relaxation of capital constraints for financial institutions, and the reduction of information asymmetries and agency costs are often cited as structured finance benefits.[155] Additionally, "*…the structuring process serves to complete the financial market by creating high-credit-quality securities that would otherwise not exist in the market…*" [Rajan and McDermott (2007)].[156]

[153] Tavakoli (2008) argues that "*… both banks and insurance companies engage in regulatory capital arbitrage as a prime motivation for securitization of assets that offer a low return on regulatory capital.*"

[154] According to Leland (2007), financial synergies are often referred to as the principal reason for structured finance. Allowing for a model where information is symmetric, cash flows are verifiable, and there are no agency costs, the author points out that "*… financial synergies can be of significant magnitude, and it provides a clear rationale for asset securitization and project finance.*" Consistent with Gorton and Souleles (2005), Leland (2007) argues that securitization is more desirable when the originating firm is riskier. When referring to project finance, Leland (2007) points out that the use of separate financing allows greater additional debt financing.

[155] See, for example, Rosenthal and Ocampo (1988), Lockwood et al. (1996), Oldfield (1997), Esty (2003), DeMarzo (2005), and Fender and Mitchell (2005).

[156] For example, by issuing CDOs from portfolios of bonds or loans rated A, BBB, or BB, financial intermediaries can create a larger pool of AAA-rated securities and a small unrated or low-rated bucket

Taking into account the prior, as well as the current literature available in the field of structured finance, we have identified the following categories of key economic benefits provided by structured finance, which will be developed further in the next sections: (1) it enables the financing of a unique asset class that (i) previously may have been financed only by traditional borrowing methods or (ii) could not be financed at all without structured finance – thus, structured finance is a source of liquidity and funding diversification; (2) it can reduce borrowing costs; (3) it contributes to more complete capital markets, improving operational and informational efficiency; (4) it can reduce agency costs; (5) it contributes to a reduction of information asymmetries; (6) it allows the issuer to obtain more leverage compared to senior unsecured debt and to increase tax shields/savings; (7) it permits the originator/sponsor to improve/preserve financial and regulatory ratios; (8) it may transfer the risk of assets or liabilities to allow an originator to do additional business without expanding its balance sheet – risk management; and (9) it grants more flexibility to issuers, in terms of maturity structure, security design, and asset types – financial flexibility.

Table 3.2 provides a map with the mentioned economic forces underlying the creation of structured finance transactions or products and identifies those which are behind the implementation of each specific type of structured finance transaction; i.e., securitization,[157] project finance,[158] LBOs,[159] and structured leases.[160]

where almost all the credit risk is concentrated; i.e., the CDO tranching process creates both higher and lower credit quality financial instruments from the original portfolio.

[157] The rationale for the emergence of securitization transactions should be seen in economic advantages associated with: (1) increasing liquidity and funding [e.g., Roever and Fabozzi (2003), Jobst (2006a), and Krebsz (2011)]; (2) reducing the cost of funding [e.g., Goldberg and Rogers (1988), Davidson et al. (2003), Roever and Fabozzi (2003), Jost (2006), Fabozzi and Kothari (2007), and Fabozzi et al. (2006)]; (3) allowing originators to obtain diversification of funding sources [e.g., Davidson et al. (2003), Roever and Fabozzi (2003), Fabozzi and Kothari (2007), and Krebsz (2011)]; (4) improving originators' risk management [e.g., Cumming (1987), Goldberg and Rogers (1988), Rosenthal and Ocampo (1988), Davidson et al. (2003), Jobst (2006a), and Fabozzi and Kothari (2007)]; (5) increasing the segmentation between the origination and investment functions [e.g., Davidson et al. (2003)]; (6) allowing originators to benefit from regulatory and/or tax arbitrage [e.g., Cumming (1987), Jones (2000), Davidson et al. (2003), and Krebsz (2011)]; and (7) allowing originators to improve key financial ratios [e.g., Goldberg and Rogers (1988), Roever and Fabozzi (2003), Fabozzi and Kothari (2007), and Krebsz (2011)]. Additionally, securitization can help to reduce real-world costs, like regulatory costs, information costs, agency costs, and bankruptcy costs [Hill (1996)]. See Annex 1 for further discussion of the economic motivations for using securitization.

[158] Taking into account the available literature in the field of project finance, the use of such structured finance transactions may enable sponsors to obtain several benefits, namely: (1) reduction of funding costs [e.g., Kleimeier and Megginson (2000), Esty (2003), and Gatti (2005)]; (2) maintenance of the sponsors financial flexibility [e.g., Nevitt and Fabozzi (2001), Gatti (2005), and Fabozzi et al. (2006)]; (3)

		Structured Finance Transactions			
		LBOs	Project Finance	Securitization	Structured Leasing
Motivations for Using Structured Finance	Source of Liquidity and Funding Diversification				
	Reduction of Funding Costs				
	Improved Efficiency (Informational and Operational)				
	Reduction of Agency Costs				
	Reduction of Information Asymmetries				
	Higher Leverage and Tax Shields/Savings				
	Improve/Preserve Financial and Regulatory Ratios				
	Risk Management				
	Financial Flexibility				

Table 3.2: Motivations for using structured finance transactions or products.

Despite the common motivations behind all the types of structured finance transactions (e.g., reduction of information asymmetries, higher leverage and tax shields/savings), it can be concluded from Table 3.2 that securitization and project finance are the transactions with more common economic motivations or benefits. This is a very relevant conclusion as we use asset securitization bonds and project finance loans as

higher debt-to-equity ratios [e.g., Nevitt and Fabozzi (2001), Gatti (2005), and Fabozzi et al. (2006)]; (4) separate incorporation and avoidance of contamination risk (the separation of large, risky projects in an SPV) [e.g., Fabozzi et al. (2006)]; (5) reduction of corporate taxes [e.g., Esty (1999)]; (6) improve risk management [e.g., Brealey, Cooper, and Habib (1996) and Esty (2003, 2004a, 2004b)]; and (7) reduction of the costs associated with market imperfections; i.e., the benefits from reducing information asymmetries, incentive conflicts, taxes, and distress costs are significant [e.g., Brealey, Cooper, and Habib (1996) and Esty (2003, 2004a, 2004b)]. See Annex 2 for further discussion of project finance economic benefits.

[159] The rationale for the emergence of LBOs can be explained by the following sources of wealth gain: (1) tax savings [e.g., Weston et al. (2001), Renneboog and Simons (2005), Kaplan and Strömberg (2009), and Guo et al. (2011)]; (2) reduction in agency costs [e.g., Opler and Titman (1993), Weston et al. (2001), Renneboog and Simons (2005), Kaplan and Strömberg (2009), and Guo et al. (2011)]; (3) wealth transfers [e.g., Weston et al. (2001) and Renneboog and Simons (2005)]; (4) better management incentives [e.g., Opler and Titman (1993), Weston et al. (2001), Kaplan and Strömberg (2009), and Guo et al. (2011)]; (5) improvement of operating performance and efficiency [e.g., Lichtenberg and Siegel (1990), Weston et al. (2001), and Kaplan and Strömberg (2009)]; (6) corporate undervaluation [e.g., Weston et al. (2001) and Renneboog and Simons (2005)]; (7) transaction costs reduction [e.g., Renneboog and Simons (2005)]; and (8) takeover defenses [e.g., Renneboog and Simons (2005)]. See Annex 4 for further discussion of the economic motivations for using LBOs.

[160] The main factors that stimulate the demand for structured leasing transactions are [Caselli (2005) and Fabozzi et al. (2006)]: (1) risk transfer and risk management of the asset; (2) funding cost reduction via tax benefits exploitation; (3) overall investment financing; (4) progressive extension of the average term for leasing transactions; (5) working capital conservation; (6) credit capacity preservation; and (5) reduction of information asymmetries between the lender (lessor) and the borrower (lessee). We present structured leasing transaction as off-balance sheet financing that can fall within one of the following two categories: (1) Leveraged Leases (or tax or true leases); and (2) Synthetic Leases (or synthetic structured leasing). See Annex 3 for an overview of structured leasing transactions.

proxies for structured finance transactions in our univariate analysis (chapter 4) and multivariate regression analysis (chapter 5).

3.3.1. Source of Liquidity and Funding Diversification

3.3.1.1. Securitization as a Source of Liquidity and Funding Diversification

The increased liquidity and diversification of funding sources are usually presented as economic advantages associated with securitization.[161] Roever and Fabozzi (2003) refer to securitization as a reliable and relatively unconstrained source of off-balance sheet financing, which mitigates traditional funding constrains and may favor company growth. The same line of reasoning is presented by Jobst (2006a) and Krebsz (2011), but for two different time periods. Jobst (2006a), referring to a pre-crisis (2007/2008 financial crisis) period, argues that securitization allows issuers to raise funds and improve their liquidity position without increasing their on-balance sheet liabilities and capital base. Recently, Krebsz (2011) pointed out that "*[T]he credit crisis with its far-reaching implications for the global financial markets has put the liquidity and funding strategy on the top of the agenda of most banks and financial institutions.*" Although securitization has played a relevant role in the development and propagation of the financial crisis, it also allowed financial institutions to solve liquidity and funding problems in the post-crisis period, namely as an active tool to access various lending schemes (SLSs) by central banks around the world. Similarly, Goldberg et al. (1988), Estrella (2002), Fabozzi et al. (2006), Loutskina and Strahan (2009), and Cardone-Riportella et al. (2010) present the need for new sources of funding – banks may sell loans in order to fund their assets instead of raising deposits – as one of the main types of motivations behind securitization.[162]

However, the diversification benefits of securitization may also be presented from the perspective of investors. According to Fabozzi et al. (2006) securitization transactions allow investors "*... to diversify sector interest; access different (and sometimes superior) risk-rewards profiles; and access sectors that are otherwise not open to*

[161] See, among others, Davidson et al. (2003), Roever and Fabozzi (2003), Jobst (2006a), Fabozzi and Kothari (2007), and Krebsz (2011).

[162] Once an originator is well established in the asset-backed securities market, it can look at both the corporate bond market and the asset-backed securities market when assessing its best funding source.

them." Thus, the key benefit to investors is the ability of securitization to tailor risk-return profiles.[163] Jobst (2006a) corroborates this idea and states that "*[I]nvestors of securitized debt can quickly adjust their investment holdings at low transaction costs in response to a change of personal risk sensitivity, market sentiment or consumption preferences.*" Krebsz (2011) presents the ability to address different types of investors, wider pricing, and ratings stability as the main advantages of asset securitization from the perspective of investors.[164]

3.3.1.2. Structured Leasing as a Source of Funding

As regards structured leasing, Beattie et al. (2000) argue that poor liquidity and cash flow have significant influence over leasing decisions.[165] They conclude that structured leasing is usually used by firms using complex and large-scale assets and who face liquidity and cash flow constrains.[166] According to Krishnan and Moyer (1994), "... *firms with greater financial distress potential and high debt leverage, ceteris paribus, may find financing alternatives to leasing unavailable.*" Thus, when bankruptcy probability increases, lease financing becomes a more attractive financing option as it offsets the higher transaction costs that are usually associated with lease agreements *versus* secured debt agreements.

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[163] Hill (1996) argues that securities issued in a securitization transaction "*... can have a risk and reward configuration the investor otherwise could have obtained only by acquiring, at higher cost, several securities.*"

[164] Referring to ratings' stability, Krebsz (2011) points out that prior to credit crisis securitization transactions ratings used to be relatively stable and showed a fairly low rating volatility compared to corporate bonds. Nevertheless, this "*... changed dramatically during the credit crisis when the market saw for the first time bulk downgrades of AAA-rated SF instruments, sometimes bond downgrades by up to 14 notches (i.e., for some CDO of ABS deals) in a single rating action.*"

[165] Beattie et al. (2000) present the following four major determinants of leasing: (1) industry sector is a significant explanatory factor for the level of leasing; (2) firm size has a different influence on the choice between leasing and other forms of debt finance – small companies may prefer leasing over debt; (3) tax considerations is an important factor in the choice between debt and leasing; and (4) poor liquidity and cash flow have significant influence over the decision of leasing.

[166] The authors argue that "*... the characteristics of a firm's current and future assets, and in particular asset specificity, can influence financing.*" The same line of reasoning is presented by Smith and Wakeman (1985), Williamson (1988), Krishnan and Moyer (1994), and Barclay and Smith (1995).

3.3.2. Reduction of Funding Costs

According to Jobst (2007) structured finance is invoked by financial and non-financial institutions, when established forms of external finance are either (i) unavailable for a particular financing need, or (ii) too expensive for issuers in what would otherwise be an unattractive investment based on the issuer's required cost of capital. Thus, the reduction of funding costs is commonly presented as a major economic force behind structured finance transactions.

3.3.2.1. Securitization and the Reduction of Funding Costs

The main motivations for securitization can be discussed from the perspective of a nonbank corporation and from the perspective of a bank corporation.[167] According to several authors [e.g., Goldberg and Rogers (1988), Davidson et al. (2003), Roever and Fabozzi (2003), Jost (2006a), Fabozzi and Kothari (2007), and Fabozzi et al. (2006)], the reduction of funding costs is a benefit commonly referred to either a bank[168] or a nonbank corporation.[169] According to Davidson et al. (2003), "*... firms with high-quality assets may be able to reduce their financing costs through securitization.*" This happens when bonds created through securitization have a higher credit rating or are otherwise perceived to have less risk than the originator's general obligations. The same line of reasoning is presented by Hill (1996) and Riddiough (1997). According to the authors, securitization has been used by lower-rated issuers to reduce asymmetric information costs. This is corroborated by Carow et al. (1999), who argue that "*... for corporations with a low credit rating, securitization may be able to reduce borrowing costs on that debt.*" This happens because the credit quality of the issued securities is

[167] According to Jobst (2006a), the more pertinent advantages of securitization enjoyed by financial institutions are: (1) the reduction of economic cost of capital (economic motive) and regulatory minimum capital requirements (regulatory motive); (2) the diversification of asset exposures (hedging motive); and (3) the recognition of the gains (or losses) within the moment of the true sale of the asset pool. Moreover, the reduction of agency costs (e.g., underinvestment and asset substitution) and the asset-liability management improvement "*... are particularly instrumental to the efficient capital management of non-financial corporate issuers.*"

[168] Fabozzi et al. (2006) argue that *"[B]anks can use securitization to (1) support asset growth, (2) diversify their funding mix and reduce cost of funding, and (3) reduce maturity mismatches.*" Securitization enables banks to reduce their funding costs because most of the notes issued by SPVs are higher rated than the bonds issued directly by the originating bank itself.

[169] Lupica (1998) presents several motivations for a nonbank corporation to choose to securitize its assets, namely: (1) improving liquidity; (2) increasing diversification of funding sources; (3) lowering the effective interest rate; (4) improving risk management; and (5) achieving accounting-related advantages.

based on the underlying pool of assets, not the issuer's credit rating. As a result, the originator is allowed to issue a security with a credit rating superior to its own.[170]

3.3.2.2. Project Finance and the Reduction of the Net Cost of Financing

According to Gatti (2005), the use of project finance may enable sponsors to obtain a reduction of funding costs. This happens when the "*... structuring cost for the initiative (that in any event is very high, especially if the deal is extremely complex) is less than the saving on funding cost, owing to the improved credit rating obtainable by the venture when compared to that of the sponsor.*" The same intuition is shown by Esty (2003) who states that "*... project finance reduces the net cost of financing these assets* [i.e.] *project companies have evolved as institutional structures that reduce the cost of performing important financial functions such as pooling resources, managing risk, and transferring resources through time and space…*" Project finance reduces risk through credit enhancement and other structuring devices, which reduce lender exposure by altering borrowers risk profiles over time.

Empirically, the reduction of funding costs is corroborated by Kleimeier and Megginson (2000), who find that "*... floating-rate PF loans have lower credit spreads (over LIBOR) than do most comparable non-PF loans.*" According to Stiglitz and Weiss (1981), the distinctive role of banks is to overcome information problems and minimize adverse selection in the lending market. Financial intermediation, information revelations, and monitoring are the channels through which banks reduce the costs of funds [Diamond (1984)]. Project finance enables lenders to distinguish project performance from firm performance, monitor project management decisions, and

[170] If a corporation wants to issue bonds collateralized by a pool of assets it probably will have the same funding cost as if it issues a corporate bond. But if the company creates another legal entity (SPV) and sells the assets – in such a way that if the company is forced into bankruptcy (there is a 'true sale') its creditors cannot try to recover the financial assets because they are legally owned by the SPV – to that entity who issues bonds backed by those assets, investors interested in buying the bonds will evaluate the credit risk of the assets. Additionally, the SPV will show the characteristics of the collateral to a rating agency which evaluates the credit quality of the collateral and will inform the issuer what must be done to obtain a desired credit rating. In this case, the issuer must be asked to 'credit enhance' the structure. Basically, rating agencies look at the potential losses from the collateral and make a determination of how much credit enhancement is needed for the bond classes issued to achieve the ratings targeted by the issuer. Thus, the company can obtain funding using its assets to achieve a better credit rating for the bonds issued than otherwise would be obtained if the company chose to issue corporate bonds – with enough credit enhancement, it can issue a bond with a triple A rating.

determine the cash flow available for interest and principal repayment, thus reducing the net costs of financing.

3.3.2.3. Structured Leasing and the Reduction of Funding Costs

Comparing leasing with purchasing using borrowed funds, Fabozzi et al. (2006) present funding cost reduction via tax benefits as one of the major economic forces behind structured leasing.[171] In a tax-oriented transaction, the lease is treated as a true sale for tax purposes, so that tax benefits of ownership can be transferred to the lender. This is crucial in a true sale lease transaction, where a lessee cannot use tax benefits associated with equipment ownership due to the lack of currently taxable income or net carryforwards of operating loss.[172] According to Caselli (2005), "*... the tax variable becomes a powerful tool for creating economic maneuvering room to reduce the cost of capital for its users.*" Capturing tax benefits means taking advantage of the differences in tax treatment between leasing and other forms of financing with the aim of reducing the lessee's cost of capital – reduction of the all-in cost.[173] Additionally, Eisfeldt and Rampini (2009) argue that the benefit of leasing is that the repossession of leased assets is easier than the foreclosure of secured loans; i.e., lease financing has an advantage over straight debt and even secured debt, as far as it offers a stronger financial claim, being effectively senior to any other financial claim.[174]

Referring to the use of leasing in project financing, Fowkes (2000) argues that true leasing may provide an alternative source of funding at a lower cost; i.e., in a leveraged lease (or tax or true lease) the lessee forgoes tax depreciation benefits but negotiates

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[171] According to Beattie et al. (2000), "*[L]easing provides the option of 'selling' tax allowances to a lessor, in exchange for lower rental payments.*"

[172] Lease payments from leasing rather than borrowing are lower if a lease transaction is properly structured in a way that the lease will be treated as an operating lease for financial reporting purposes and as a true lease for tax purposes. A synthetic lease is a type of structured leasing transaction that meets this need while avoiding one of the drawbacks of a true lease for many lessees: the possibility of loss when the true sale lease terminates and the equipment may have to be acquired from the lessor.

[173] As in other tax-based techniques, the implementation of a structured leasing transaction is more important when the value of the asset is large and allows for a potentially greater appropriation of tax benefits.

[174] Some authors study the debt *versus* leasing decision. Ang and Peterson (1984) fail to demonstrate that debt and leasing are substitutes and find a complementary relationship. Although Lewis and Schallheim (1992) find similar results, Marston and Harris (1988), and Adedeji and Stapleton (1996) support substitutability. More recently, Mehran et al. (1997) present mixed evidence and Beatti et al. (2000) argue that leasing and debt are partial substitutes.

lower lease rates with the lessor. Altamuro (2006) shows that synthetic leases provide an economic benefit for the lessee in the form of lower direct financing costs – she finds that "*... synthetic lease firms receive more favorable interest rates on future syndicated loans.*"[175] The minimization of bankruptcy risks for the bank or leasing company, compared to traditional real estate loan, is commonly presented as an effective benefit for lenders which is reflected in the borrower all-in cost.

3.3.3. Improved Efficiency

In an Arrow and Debreu (1954) world, with perfect and complete markets, financial innovation through the sale of new types of securities does not add value for firms and investors, since the cash flows generated by a new security can be replicated by a combination of existing securities.[176] Nevertheless, if financial markets are incomplete, adding new types of securities can be valuable if it helps to make markets more complete. Provided that an investor can obtain benefits of diversification by adding structured finance securities to his portfolio, then the identification of the sources of market incompleteness by arrangers can make these type of securities profitable.

Moreover, and regarding operational efficiency, several authors argue that structured finance allows companies to profit from their comparative advantages.

3.3.3.1. Efficiency and Securitization

When facing perfect capital markets, repackaging – pooling assets and then reselling the pool as a collection of new securities – and tranching – transforming the profile of expected cash flows into multiple tranches – would not create value. However, this is at odds with the reality of the securitization market. Gaur et al. (2003) argue that if asset (re)packaging helps to complete markets, then the market will place a premium on them

[175] Altamuro (2006) presents the following three major benefits to lessees using synthetic leases: (1) the ability to finance 100% of the purchase price of the asset; (2) providing favorable financing taxes *vis-a-vis* traditional debt financing; and (3) generating financial reporting benefits – as the synthetic lease is an off-balance sheet transaction, neither the asset nor the related liabilities are reported in financial statements.

[176] The fundamental asset price insight of Arrow (1964) and Debreu (1959) is that an asset's value is determined by state prices and its distribution of payoffs across economic states. Thus, securities that guarantee their promised payments in the best economic states will have high values, because these are the states where a dollar is less valuable.

and the originator can profit from pooling and tranching the assets. "*[T]hus, even though the market is incomplete, there is demand from individuals who are willing to buy unspanned claims at arbitrage-free prices.*" Repackaging gains can be explained by three market imperfections: transaction costs, market incompleteness [Duffie and Rahi (1995), Riddiough (1997), and Gaur, Seshadri, and Subrahmanyam (2003)], and asymmetric information.

The segmentation of financial markets gives rise to arbitrage opportunities which may be exploited by originators in creating asset securitization securities.[177] Oldfield (2000) presents this idea noting that structuring profits can result from price discrimination.[178] The common referred types of arbitrage opportunities that usually arise when market segmentation exists are: (i) limits imposed by preferences, investment mandates or regulation;[179] and (ii) pricing differentials among assets.[180] In order that these opportunities become effective it must be impracticable for other arbitrageurs to step in and force the profit from structuring a transaction to be zero.[181] With regards to structured mortgages securities (a type of securitization), Oldfield (2000) points out that "*... structuring activity is designed to segment customers and create price discrimination by selling different tranches for different prices…*"; i.e., an underwriter profits with price discrimination. A successful underwriter must possess some advantages, based on either customer information, access to collateral, or structuring analytics. In this way, the arguments presented by the author suggest that more complex or unusual assets may lead more easily to structured finance transaction than standardized ones.

Likewise, Fender and Mitchell (2005) suggest that segmented financial markets (due, for example, to the existence of investors with ratings-based investment mandates) may make it attractive for structured finance arrangers to create new assets with desired loss

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[177] Described and formally characterized by Varian (1987). Shleifer and Vishny (1997) provide a discussion of the limits to arbitrage. If efficient arbitrage prevails – commonly in liquid markets with low transaction costs – financial structuring does not create value.

[178] Price discrimination works by selling different tranches of a transaction for different prices.

[179] This may limit the access of particular groups of investors to securities that might otherwise be desirable. The arranger takes advantage of knowledge about investors' demands by practicing price discrimination and captures part of the premium that the investor is willing to pay for the tailored product.

[180] Such arbitrage opportunities emerge from differences in corporate bond spreads across rating categories.

[181] For an arbitrageur to eliminate structuring profits, it is important that transaction costs are low and there are plenty of buyers and sellers.

characteristics for particular investor classes. The investors benefit as structuring allows the completion of incomplete financial markets – for example, by enabling investors constrained to invest in certain types of rated securities to gain exposure to asset classes like leveraged loans. Another example is given by Fabozzi et al. (2006) who argue that securitization transactions allow investors "*... to diversify sector interest; access different (and sometimes superior) risk-rewards profiles; and access sectors that are otherwise not open to them.*" The same line of reasoning is presented by Jobst (2007). The author argues that securitization offers sponsors the flexibility to create securities with diverse risk-return profiles in terms of security design. It also contributes to a more complete capital market, by offering any mean-variance trade-off along the efficient frontier of optimal diversification at lower transaction cost.[182]

Finally, Lancaster et al. (2008) argue that securitization has played a critical role in improving the efficiency, liquidity, and availability of capital. However, the underlying assumption behind the argument that securitization improves the efficiency of credit markets is that there is no information loss between borrowers and investors, which had not happened before the financial crisis of 2007/2008.[183] As pointed out by Bolton et al. (2010), this information loss can be explained by conflicts of interest[184] that emerged from Credit Rating Agencies' (CRAs) behavior in structured finance markets, which may have reduced market efficiency – competition among CRAs facilitated ratings shopping by issuers and resulted in excessively high reported ratings.

As regards operational efficiency, Berger and Udell (1993) suggest that the 'monitoring technology hypothesis' of securitization allows companies to obtain technological gains from specializing in niches of comparative advantage (which suggests economies of scale in those activities). Hill (1996) argues that securitization may increase the future cash inflows of a firm due to effects of specialization in the origination and retention of

[182] The same idea is presented by the Committee on the Global Financial System (2005): "*[I]nvestors' interest has been motivated by portfolio diversification and attractive risk-return profiles.*"

[183] For further discussion of the causes and consequences of the 2007/2008 financial turmoil see section 3.5.

[184] Bolton et al. (2010) point out three sources of conflicts of interest in the Credit Ratings Agencies (CRAs) industry, namely: (i) CRAs can understate credit risk to attract more business; (ii) issuers are allowed to purchase only the most favorable ratings; and (iii) some investors (trusts) may take ratings at face value.

receivables. This idea is corroborated by Thomas (2001), who states that "... *securitization allows companies – FIs* [Financial Institutions] *as well as non-FIs – to specialize on the activities of their comparative advantage.*"

3.3.3.2. LBOs and the Improvement of Operating Efficiency

Lichtenberg and Siegel (1990), Weston et al. (2001), and Kaplan and Strömberg (2009) present the improvement of operating performance and efficiency as one of the main sources of wealth gains in LBOs. Lichtenberg and Siegel (1990) argue that LBOs contribute to a better allocation of resources in the economy by improving the operating performance of the target firm. According to Weston el al. (2001), the decision process can be more efficient under private ownership, which is associated with the delisting of the target firm.

LBOs add industry and operating expertise, creating value to target companies. Private equity firms use their industry expertise and operating knowledge to develop value creation plans for their investments. The empirical evidence on the operations performance of companies shows largely that LBOs are associated with significant operating and productivity improvements. Cumming, Siegel, and Wright (2007) summarize much of this literature and conclude that there "*... is a general consensus across different methodologies, measures, and time periods regarding a key stylized fact: LBOs [leveraged buyouts] and especially MBOs [management buyouts] enhance performance and have a salient effect on work practices.*"

3.3.4. Reduction of Agency Costs

Adam Smith (1776) was the first to point out that large firms are not owned and operated by individual entrepreneurs. Smith recognized that the separation of the controlling power assigned to residual claimants and the power committed to professional managers is a source of inefficiency, due to potential misalignment between their objective functions.[185] Since managers are responsible for control, it is

[185] According to Berle and Means (1932), a fundamental source of agency problems in firms is the separation of ownership and control. The owners of capital do not usually run the business they are financing, but leave it to agents (managers) to maximize returns on their investment. This gives rise to

possible to identify a triangular agency relationship between the manager, the investors with residual claims (equity holders), and the investors with fixed claims (debt holders); i.e., conflicts of interest do not arise exclusively from the manager-shareholder agency relationship. Other claimholders, such as debt holders, also have vested interests in the firm.[186] As pointed out by Jensen and Meckling (1976), both equity and debt financing generate specific agency problems.[187]

Ultimately, the incentives of the managers and possible conflicts of interest depend on the precise nature of the contracts governing the relationship between managers and owners, as well as on the firm's financial structure. The inability to write complete contracts, combined with the fact that it is costly to monitor and enforce contracts, creates the potential for incentive conflicts between various agents inside firms. Therefore, one of the agency theory's principal concerns is the design of efficient contractual arrangements allowing residual claimants (principals) to exercise their ownership control rights and monitor agents' decision-making.[188]

These incentive conflicts relate to investment decisions, which can fall into one of the following four categories: (1) overinvestment in negative NPV projects – known as free cash flow conflicts [Jensen (1986)]; (2) investment in high-risk, negative NPV projects – known as risk shifting [Jensen and Meckling (1976)]; (3) underinvestment in positive NPV projects – known as debt-overhang [Myers and Majluf (1984)]; and (4)

conflicts of interest and diverging objectives between the agent and the capital owners (investors). See, among others, Eisenhardt (1989) for a discussion of agency theory.

[186] Conflicts of interest between equity holders and debt holders result from the opportunistic behavior that allows owners to attempt to add to their own wealth at the debt holders' expense. Typically, the most prevailing causes involved in shareholders-debt holders agency problems are: (1) claim dilution [Jensen and Smith (1985)]; (2) risk shifting [Jensen and Meckling (1976)]; (3) unexpected increases in dividend payments [Kalay (1982)]; (4) asset substitution [Jensen and Meckling (1976), Galai and Masulis (1976), and Jensen and Smith (1985)]; (5) underinvestment [Myers (1977, 1984)]; and (6) overinvestment [Jensen and Meckling (1976)].

[187] Several conditions should be observed in order that an agency problem arise in an agency relationship. First, a conflict of interest between the principal and the agent develops. However, this factor alone is not sufficient, because in a world without uncertainty it would be possible, *ex ante*, to write an incentive contract to induce the agent to act in the principal's best interest. Thus, agency problems are also associated with uncertainty and the costs of writing and executing contracts. Agency costs, those that arise from agency problems, are the sum of the out-of-the pocket costs of structuring, administering, and enforcing contracts plus any residual losses involved [Jensen and Meckling (1976)].

[188] Literature concerning agency theory has developed along two theoretical paths: the positive and the normative (principal-agent). Among the most influential contributors to the positive agency theory path are Jensen and Meckling (1976). Other important contributors are Fama and Miller (1972), Jensen (1983), Jensen (1986), and Stulz (1990). See, e.g., Charreaux (1987) for a review of the literature on the positive agency theory. For further discussion of principal-agent theory see, among others, Ross (1973), Harris and Raviv (1979), Grossman and Hart (1983), Sappington (1991), and Rajan (1992).

underinvestment in risky, positive NPV projects due to managerial risk aversion [Smith and Stulz (1985)].

3.3.4.1. Project Finance and the Reduction of Agency Costs

Esty (1999) argues that project finance can help to eliminate all four aforementioned investment distortions.[189] It reduces overinvestment in negative NPV projects by requiring project companies to raise external funds from third parties;[190] it reduces debt-overhang problem by assigning project returns to new investors rather than existing capital providers;[191] and it reduces the underinvestment in risky, positive NPV projects by isolating project risk and so reducing the risk contamination to sponsoring firms.[192]

The same idea is presented by Brealey, Cooper, and Habib (1996), who argue that project finance creates value by resolving agency problems. Project finance can be used to mitigate costly agency conflicts (1) inside project companies – conflicts between sponsors (ownership) and managers (control) and conflicts between sponsors and related parties; and (2) among capital providers – conflicts between debt holders and equity holders. According to Esty (2003, 2004a, 2004b), the creation of a special entity separate from the party or parties sponsoring the transaction provides an opportunity to address the agency conflicts between ownership and control.[193]

Project finance structures use high ownership concentration and high leverage to discourage costly agency conflicts among participants. Esty (2004b) argues that project

[189] To explain the economic importance of project finance transactions, most existing studies focus on agency or moral hazard problems. See, e.g., An and Cheung (2010).

[190] The use of high leverage forces managers to disgorge free cash flow in the form of interest and principal payments thereby limiting their ability to invest. Even though high leverage exacerbates the risk shifting problem, a project finance transaction is designed to minimize value destruction.

[191] Project finance transactions allow companies with little spare debt capacity to avoid the opportunity cost of underinvestment in positive NPV projects. According to Esty (2003) project finance solves this problem "*... by allocating project returns to new capital providers in a way that cannot be replicated using corporate debt.*" Because this conflict occurs at the sponsor rather than the project level we distinguish the debt-overhang problem from agency cost motivation. See Myers (1977) for further discussion of debt-overhang phenomenon.

[192] John and John (1991) present a theoretical analysis based on this underinvestment incentive of managers. They show that financing projects separately can reduce the agency cost of underinvestment. A similar idea is presented by Berkovitch and Kim (1990).

[193] As referred by Esty (2003), "*[I]n many ways, the observed governance structures in project companies resemble leveraged-buyouts (LBOs) and achieve many of the same results described by Jensen (1989) and Kaplan (1989 and 1991).*" Gatti (2008) points out that the separation of the company and the new investment project is always the first best option for shareholders.

finance highly levered capital structures play an important disciplinary role, because they prevent managers from wasting free cash flow, and deter related parties from trying to appropriate it.[194] The project company has to allocate cash flows according to a pre-determined 'cash waterfall', leaving no room for managerial discretion. Additionally, the combination of concentrated equity ownership (small board of directors comprised of directors from each sponsor) and direct control (compensation contracts for managers linked to project performance) prevents a wide range of incentive problems. In summary, structural features of project finance transactions, like extensive contracting, concentrated debt and equity ownership, separate legal corporation, and high leverage, reduce costly agency conflicts at the project level.

3.3.4.2. LBOs and Agency Costs Reduction

According to Opler and Titman (1993),[195] Weston et al. (2001), Renneboog and Simons (2005), Kaplan and Strömberg (2009), and Guo et al. (2011), the emergence of LBOs can be explained by wealth gains obtained via the reduction of agency costs. Three hypotheses are usually applied: (1) the incentive realignment hypothesis; i.e., the need to realign incentives of managers with those of shareholders, is frequently mentioned as a potentially important factor in LBO transactions [Kaplan (1989b)]; (2) the control hypothesis, meaning that the wealth gains come from the increase in the quality of control – an LBO transaction leads to a reunification of ownership and control by mitigating the free-rider problem [Grossman and Hart (1980)] in monitoring managerial actions in public corporations with a dispersed shareholder structure;[196] and (3) the free cash flow hypothesis, suggesting that the wealth gains of LBOs are largely the result of

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[194] The agency explanation of capital structure emphasizes the incentive conflicts among providers of equity capital, providers of debt capital, and firm managers. Project financing reduces the underinvestment cost of debt capital caused by the agency conflict between debt holders and equity holders. According to Esty (2004b), "*[T]hus it provides strong empirical support for agency-based theories of capital structure in the presence of incomplete contracts.*" For further discussion of capital structure and structured finance see sub-section 3.3.6.

[195] Opler and Titman (1993) assert that "*[P]roponents of LBOs (e.g., Jensen (1986, 1989)) argue that the transactions create wealth by improving managerial incentives and forcing disgorgement of excess free cash flow that would otherwise be invested unwisely.*"

[196] See, e.g., DeAngelo, DeAngelo, and Rice (1984), Admati, Pleiderer, and Zechner (1994), and Maug (1998).

the elimination of free cash flow problems – according to Jensen (1986), managers have incentives to retain resources and make firms grow beyond their optimal size.[197]

Regarding the hypotheses presented, Jensen (1989) and Kaplan (1989a and 1989b) argue that by paying careful attention to management incentives, LBOs reduce agency problems between managers and shareholders. Private equity firms typically give the management team a large equity upside through stocks and options, and require management to invest in the company. Additionally, because companies are private, management's equity is illiquid, what reduces their incentive to manipulate short-term results. Secondly, private equity investors control the boards of the acquired companies more actively and become more involved in their governance. This last idea is also presented by Tirole (2006). The author argues that LBOs, as governance instruments of the market for corporate control, create "*... a new and superior form of corporate governance.*"[198] The third key ingredient in reducing agency problems is leverage – third hypothesis.[199] As pointed out by Kaplan and Strömberg (2009), "*[L]everage creates pressure on managers not to waste money, because they must make interest and principal payments. This pressure reduces the 'free cash flow' problems described in Jensen (1986)…*"

3.3.4.3. Securitization and the Reduction of Conflicts of Interest

Riddough (1997) proposes a model of asset securitization where there is a conflict of interest between junior and senior security holders. The author points out that the design

[197] See, e.g., Jensen (1986), and Cotter and Peck (2001).

[198] Andres et al. (2007) examine a sample of 115 European leveraged going to private transactions from 1997 to 2005 and posit that corporate governance mechanisms – related to free cash flow, shareholder protection, undervaluation and the market for corporate control – are "*... important factors in explaining the short term gains generated by European LBOs.*" The same line of reasoning is presented by Nikoskelainen and Wright (2007). According to Gertner and Kaplan (1996), and Acharya and Kehoe (2008), LBOs company boards are smaller and meet more frequently than public companies. Furthermore, private equity investors quickly replace management with poor performance. Guo et al. (2011) find that cash flow performance increases when the private equity replaces the CEO before or at the time of the LBO.

[199] Grossman and Hart (1982) and Jensen (1986, 1989) argue that debt can induce management to act in the interests of investors in ways that cannot be duplicated with optimally designed compensation packages. Guo et al. (2011) examine (for a sample of 192 buyouts completed between 1990 and 2006) if and how, LBOs create value. They argue that consistent with the benefits of debt, "*... cash flows gains are greater for firms with greater increases in leverage as a result of buyout.*"

of asset-backed securities depends on the security governance structure.[200] In practice, the contractual structure is built up to specify the rights and responsibilities of the note holders and other third-party managers, in an attempt to reduce the conflicts of interest.

Securitization may redress conflicts of interest between creditors and shareholders in the capital structure choice of firms concerning possible agency costs due to underinvestment [Myers (1977, 1984)] and asset substitution [Jensen and Meckling (1976)]. Using optimal risk allocation models, Benveniste and Berger (1987) and James (1988) show that securitization can improve risk sharing and increase project funding by avoiding the Myers (1977) underinvestment problem.[201]

Shyam-Sunder and Myers (1999) point out that, under the pecking order theory,[202] issuers with severe information asymmetry problems would prefer to issue secured debt (i.e., asset-backed) – which carries lower agency costs – because investors receive their repayment directly from a diversified pool of asset exposures insulated from the issuer. According to the trade-off theory,[203] the choice of secured debt would be restricted to those cases where the marginal benefit of debt outweighs the associated amount of agency and financial distress costs. This idea is corroborated by Jobst (2006a), who asserts that "*... under the pecking order and trade-off theory asset securitisation is the refinancing instrument of choice for cash-strapped issuers, whose high agency costs of asymmetric information debar them from other forms of external finance.*"

The credit crisis of 2007/2008 has somehow tarnished the positive role played by securitization in helping to mitigate costly agency conflicts. Several authors [e.g., Alles (2001), Jobst (2006a), Fabozzi and Kothari (2007), and Jobst (2009)] argue that securitization may lead to a severe principal-agent problem where the firm, who originates the assets to be ultimately sold and securitized, retains little or no interest in

[200] In a negotiation process with financial distress borrowers, conflicts of interests will emerge between junior and senior security holders, because the senior ones generally prefer immediate payoff to extension. However, for junior security holders – who possess superior asset pool information – loan extension incentives usually lead to higher levels of subordination.
[201] See Jobst (2006a) for further discussion of this subject.
[202] Myers and Majluf (1984) considered the effects of information asymmetry between managers and lenders on capital structure decisions and developed a model that shows why a firm may prefer to fund new projects with internal funds first, followed by external debt and finally external equity – the so-called pecking-order theory.
[203] This theory holds that firms balance the tax advantage of borrowing against the cost of financial distress. See Miller (1977), Fama and French (1998), and Graham (2000). See sub-section 3.3.6 for further discussion of capital structure in structured finance framework.

the pool of securitized assets. They argue that, in the 2007/2008 financial crisis, originators and issuers were tempted to pursue their own economic incentives, which imposed a substantial agency cost on an otherwise efficient asset securitization. This subject will be further developed in section 3.5.

3.3.5. Reduction of Information Asymmetries

In financial contracting, the parties usually do not have all the information they need to make optimal decisions. Furthermore, other than not being completely informed, insiders and outside investors are also unequally informed. As referred by Leland and Pyle (1977) "*... in financial markets, informational asymmetries are particularly pronounced.*"[204] This phenomenon is well known in the literature of corporate finance as the asymmetric information problem.

Seminal contributions of Akerlof (1970),[205] Spence (1973), and Crawford and Sobel (1982) support the development of the asymmetric information theories, suggesting that information is not costless and symmetrically distributed among economic agents. This reality has an impact on the economic wealth of contracting parties. When looking into financial instruments, unequal distribution of information amongst buyers and sellers limits their ability to ascertain the real characteristics of firms, projects or assets. In this scenario, the party with informational superiority tends to behave opportunistically and take advantage of this. The most common problems of asymmetric information are the adverse selection problem[206] and the moral hazard problem.[207]

[204] It is widely accepted that securities are often issued under unequal access to information; i.e., different participants in financial markets typically have varying amounts of information about securities offered in the market. The market failure to distribute information symmetrically amongst agents introduces incentive problems in financial contracting, which are potential impediments preventing prices from fully reflecting available information. Asymmetric information problems are not costless because financial contracting tends to be more complex – which increases transaction costs – and particular forms of financial contracting are necessary to minimize the costs accruing to financing.

[205] Akerlof (1970) pointed in his landmark paper that a market (the market for lemons) may function badly, or not function at all, if the one party (the informed one) has no way to signal the quality of the good it is selling.

[206] The adverse selection problem is an *ex ante* form of information asymmetry, as it arises before the parties are engaged in any kind of binding contractual arrangements. As argued by Macho-Stadler and Pérez-Castrillo (1997), the adverse selection problem "*... appears when the agent holds private information before the relationship is begun.*" The adverse selection problem can be solved by conveying private information that signals to less informed parties the true characteristics of the issuer.

The literature of security design initially focused on the adverse selection problem. Leland and Pyle (1977) assert that when owners of a project have private information about the project, the amount of their own funds invested will be interpreted as a signal of its quality – the greater the amount of equity retained, the higher the quality of the project. Gordon and Pennacchi (1990) focus on the moral hazard problem and point out that, considering the existence of informed and uninformed investors in financial markets, there is scope for splitting the cash flows from an asset to create multiple types of securities. Boot and Thakor (1993) develop a model with an intuition akin to that of Gordon and Pennacchi (1990). The major difference between the two models is that the optimal design in Boot and Thakor (1993) is supply-driven rather than demand-driven. The authors argue that, in asset markets with asymmetrically informed investors, it is optimal for firms to split their cash flows through a senior / subordinated security design.[208] Similarly, Diamond (1993), Winton (1995), and Glaeser and Kallal (1997) argue that the design and issuance of different classes of securities with different degrees of seniority – structuring – reduces monitoring costs.

3.3.5.1. The Role of Securitization in the Reduction of Information Asymmetries

Hill (1996) argues that securitization can help reduce 'real-world costs', like information costs. Information cost reductions seem largest for firms who face severe 'lemons problems'. As asserted by Hill (1996), "*[S]ecuritization removes, and sweetens, a slice from the lemon – while leaving the remainer not appreciably sourer than it was before.*"; i.e., securitization offers a credible and less costly way for information about the firm's receivables to be produced and provided to investors. Similarly, Iacobucci and Winter (2005) argue that "*... asset securitization is driven by*

[207] The moral hazard problem is an ex post form of information asymmetry, as it arises after the parties are committed to financial contracting arrangements. As referred by Salanié (1997), moral hazard behavior occurs when "*... (a) the Agent takes a decision ('action') that affects his utility and that of the Principal; (b) the Principal only observes the 'outcome', an imperfect signal of the action taken; and (c) the action the Agent would choose spontaneously is not Pareto-optimal.*" Therefore, this behavior takes place whenever the seller of a security has an incentive to hide information and pursue activities that are not desirable for the investor. Solutions to moral hazard in debt contracts are related to the inclusion of provisions (e.g., covenants) that align the incentives of the borrower to those of the lender.

[208] They show that it is more profitable for a firm to issue multiple securities with 'information insensitive' cash flows paid to the senior security holders and 'information sensitive' cash flows paid to the subordinated security holders.

the propensity of the market to allocate assets to investors who are best informed about asset values."

If there is asymmetric information about the firm's value and investment opportunities, there are additional costs of raising funds. Securitization reduces the cost of selling undervalued securities, because the information about the firm and its assets becomes less expensive, decreasing the monitoring costs incurred by investors. According to Greenbaum and Thakor (1987), private information about the originated assets would induce financial institutions to prefer the securitization of better quality assets to mitigate their regulatory capital requirements for 'overcharged' asset exposure, whilst worse quality assets are retained.[209] Boot and Thakor (1993) and Riddiough (1997) show that a financial institution wishing to raise funds in the presence of asymmetric information can increase revenue by pooling assets and issuing different types of securities against the pool of cash flow.[210]

DeMarzo and Duffie (1999) developed a model akin to Boot and Thakor (1993) and argue that, considering the design of asset-backed securities, the *"... optimal tranche will consist of a senior claim against the pool. The issuer retains the residual portion plus any unsold fraction of the senior tranche.*"[211] DeMarzo (2005) extends DeMarzo and Duffie's (1999) model and concludes that pooling and tranching allow intermediaries to leverage their capital more efficiently, enhancing the returns to their private information.

Fender and Mitchell (2005) argue that "*... structured finance products may be more effective than other financial instruments at addressing problems of adverse selection and segmentation in financial markets.*" In the presence of these two imperfections in financial markets, tranching may add value. The same line of reasoning is presented by Pais (2009), who argues that depository institution reduces the degree of information asymmetry about that pool of loans by securitizing the loans. According to Pais (2009),

[209] This idea is corroborated by Ambrose et al. (2005) who find that, similar to Calem and LaCour-Little (2004) and DeMarzo and Duffie (1999), lower risk loans are securitized.

[210] Riddiough (1997) argues that since an issuer will suffer no asymmetric information losses on asset-backed securities, splitting off a riskless security is beneficial. He shows that the retention of the risky security and the adjustment of the levels of subordination can mitigate the asymmetric information problems.

[211] This behavior is consistent with observed practice in securitization markets, where originator commonly retains the first loss tranche.

asset securitization can "*... reduce information-related costs, particularly for riskier (unfavorable information) or more opaque institutions.*" First, because the originator pools and isolates assets in an SPV, in such a way that the risk of the securities backed from those assets depends only on the pool's risk. Using credit enhancement mechanisms further reduces the risk of the securities, so the resulting securities can obtain higher ratings. Second, the participation of credit rating agencies reduces the need of investors to produce information about the pool. Finally, the retention of first loss positions is an important instrument to mitigate conflicts due to information asymmetry.

3.3.5.2. Project Finance and Asymmetric Information

Esty (2003, 2004a, 2004b) presents the asymmetric information motivation as one of the four primary motivations for using project finance.[212] Asymmetric information allows one to understand why the combination of a firm with a project might be worth more when financed separately with nonrecourse debt (project finance) than when financed jointly with corporate funds (corporate financing).

In an incomplete information framework, the joint evaluation of the project and existing assets can be problematic.[213] As pointed out by Shah and Thakor (1987), the main benefit of project finance is to reduce the information search cost. The authors provide the first formal, theoretical work offering a rationale for project financing rather than conventional corporate financing. Project financing can be economically more valuable than conventional financing, because the cost of producing information about a single project is less than the cost of producing information about the whole of the firm's projects. By reducing asymmetric information between the firm and lenders, project financing can enhance a project's value by permitting higher optimal leverage than conventional financing. Similarly, Kensinger and Martin (1988) argue, based on a

[212] The other three primary motivations are: (1) agency cost motivation; (2) debt overhang motivation; and (3) risk management motivation.

[213] According to Esty (1999), "*[T]he separation of projects from the sponsoring firm or firms facilitates initial credit decisions* […] *With a small lending syndicate and extensive negotiations, it is relatively easy to convey information that would either be more difficult with a larger group of creditors or undesirable for competitive reasons.*"

signaling model, that riskier projects should be project-financed to reduce signaling costs.

Previous research shows that firms with asymmetric information are more prone to underinvestment [Myers and Majluf (1984)].[214] According to Esty (2004a, 2004b), project finance can help to reduce underinvestment as project finance reduces asymmetric information by eliminating the need to value assets-in-place. The separation of projects from their sponsors facilitates initial credit analysis and decisions. As pointed out by Esty (1999), "*[W]ith segregated cash flows and dedicated management, there is little room for the kind of intentional or judgmental misrepresentation that is possible with diversified or consolidated firms.*"

3.3.5.3. LBOs and Information Asymmetries

Weston et al. (2001) and Renneboog and Simons (2005) argue that the rationale behind the emergence of LBOs can be supported by wealth gains provided by corporate undervaluation. According to Weston et al. (2011), large premiums paid are consistent with the argument that the managers or investors have more information about the firm than shareholders. Asymmetric information between managers and outsiders about the firm value means that the management has superior information and knows the true distribution of future returns. The signaling theory [see, among others, Ross (1977), and Leland and Pyle (1977)] applied to LBOs suggests that, in the presence of asymmetric information, managers with favorable information are likely to hold a large share of their firms' stock and obtain outside financing disproportionally with debt. Thus, wealth gains can result from alternative higher-valued use of the firm's assets by management. This is the case in MBOs, where managers of the target company can employ specific accounting and finance techniques to depress pre-announcement share prices [see, e.g., Lowenstein (1985), Schadler and Karns (1990), Harlow and Howe (1993), and Kaestner and Liu (1996)].

[214] According to Myers and Majluf (1984), underinvestment occurs only when the value of both assets-in-place and investment opportunities are uncertain; i.e., when capital providers have asymmetric information about both assets-in-place and investment opportunities. In such a situation, the authors recommend two solutions: financing assets separately – through, e.g., project finance – and holding financial slack.

3.3.6. Higher Leverage and Tax Shields

The modern theory of optimal capital structure starts with the Modigliani and Miller (1958) value-irrelevance propositions.[215] Although their propositions are difficult to test directly, financial innovation in general, and particularly structured finance, provide strong circumstantial evidence. Furthermore, considering that structured finance transactions have been one of the principal means by which firms form their capital structures, structured finance largely affects the value of the firm.

This idea was initially presented in 1963, when Modigliani and Miller, using this logic, showed that, if corporate tax is in effect, firms should use debt exclusively as a financing instrument, since this would prevent corporate tax.[216] Still, this prediction did not fit well with empirical evidence, which suggests that firms typically use moderate amounts of debt. As leverage increases, there is an increase in the likelihood of financial distress and bankruptcy, and this should reduce the use of debt relative to equity financing.[217] However, SPVs involved in structured finance transactions have capital structures with higher leverage ratios than those of public companies; i.e., structured finance transactions are characterized by their intensive use of debt.

3.3.6.1. Project Finance and Leverage

Shah and Thakor (1987),[218] Kensinger and Martin (1988), John and John (1991), Chemmanur and John (1996), Brealey et al. (1996), and Esty (2003), among others,

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[215] Harris and Raviv (1991) provide a relatively comprehensive review of the theoretical and empirical literature related to capital structure. Myers (2001) and Barclay and Smith (2005) provide a more up-to-date discussion of the principal theories and empirical findings.

[216] The value of a levered firm would equal the value of an unlevered firm plus the tax benefit associated with debt financing.

[217] The so-called trade-off theory of capital structure [Myers (1984)]. This theory has been criticized based on a set of arguments which resulted in the development of alternative theories [see Kim (1989) for a survey of this literature]. Other theories were based on asymmetric information [Jensen and Meckling (1976), Myers (1977), and Green (1984)] and signaling [Ross (1977), Myers and Majluf (1984), and Brennan and Kraus (1987)]. In short, there are four major theories of capital structure, which differ in their relative emphases on the factors that could affect the choice between debt and equity (e.g., agency costs, taxes, asymmetric information, market imperfections, and regulatory constrains): (1) the Modigliani-Miller theory of capital-structure irrelevance; (2) the trade-off theory; (3) agency theories; and (4) the pecking-order theory. These theories overlap and all the theories may be needed to explain capital structure decisions.

[218] Shah and Thakor (1987) have developed a model that analyzes optimal financing in the presence of corporation taxation. They argue that "*... project financing enhances the values of some of these projects by permitting higher optimal leverage than with conventional financing.*"

analyze the advantages and disadvantages of project finance in the context of a firm's capital structure. Bearing in mind the trade-off theory of capital structure, a firm should increase leverage to the point where the marginal gain from incremental tax shields equals the marginal loss from incremental distress costs.[219] Leverage ratio and asset risk are the principal factors affecting the probability of default. When assets have a low-variance in asset returns, firms can increase leverage and pick up additional interest tax shields;[220] i.e., equity holders can sell virtually all of the expected cash flows to debt holders and pick up valuable interest tax shields in the process. As pointed out by Esty (2002a), "*[T]his is, in fact, one of the arguments used to justify hedging activities* […] *In practice, projects have relatively low asset risk and correspondingly high debt capacity.*"[221] It is for this reason that several studies [e.g., Esty (2002a) and Esty and Megginson (2003)] find that capital structures of project companies are very different to those of public companies. Esty (2002a) presents a mean book value debt-to-total capitalization ratio of 70% for project companies, approximately twice the similar sized CompuStat firms in 2001 (33.1%). The same idea is presented by Finnerty (2007), arguing that project finance arrangements are structured to reduce project risk and designed to achieve high initial leverage.[222] Another economic benefit pointed out by Esty (1999) is the reduction of corporate taxes; i.e., (1) tax rate reductions and tax holidays are commonly observed in project finance deals; and (2) high leverage increments interest tax shields.[223]

[219] The expected cost of distress is equal to the probability of distress multiplied by the cost of distress.
[220] See, e.g., Stulz (1996) for further discussion of this subject.
[221] This is possible because project finance allows for a high level of risk allocation among participants in the transaction. Esty (2002a) argues that project companies located in countries with a high sovereign debt rating – measured according to Standard and Poor's rating system – have higher debt to total capitalization ratios than those project companies located in countries with a low debt rating. Similarly, Vaaler, James, and Aguilera (2008) find that project firms located in countries with common law legal systems, stronger creditor rights, and wealthier economies generally have higher leverages, indicative of lower project risk.
[222] As pointed out by Nevitt and Fabozzi (2001), "*[P]roject financing can sometimes be used to improve the return on the capital invested in a project by leveraging the investment to a greater extent than would be possible in a straight commercial financing of the project.*"
[223] This idea is corroborated by John and John (1991), who refer that project financing "*... increases value by reducing agency costs and increasing value of tax shields.*"

3.3.6.2. LBOs and Leverage in Capital Structure Framework

LBOs are characterized by their very intensive use of debt. As pointed out by De Maeseneire and Brinkhuis (2011), 71% of buyout financing consists of debt. The leveraged acquisitions theory suggests that a high level of debt financing serves many roles, like the disciplining effect on management and the value of tax shields provided; i.e., the high portion of debt in LBOs gives rise to significant interest tax deductions.[224] While agreeing that tax savings are a relevant source of gains in LBOs, Kaplan (1989b), Muscarella and Vetsuypens (1990), and Smith (1990) show that wealth is also created. They find improvements in cash flows after an LBO transaction.[225]

High level of debt financing also involves disadvantages, like agency costs and bankruptcy costs. This idea is corroborated by Roden and Lewellen (1995), who argue that the financing decision to be taken by the buyout group will involve a trade-off between leverage-related costs (agency costs of high levels of debt financing and bankruptcy costs) and leverage-related benefits (disciplining effect of debt on management and the value of tax shields provided by the debt). As pointed out by Roden and Lewellen (1995), "*... the financing choices observed should reflect a trade-off that seeks to match at the margin the benefits and opportunities with the costs and constrains.*" Although the established capital structure theories claim that these and other factors drive the financing choice in LBOs, De Maeseneire and Brinkhuis (2011) find that classical capital structure theories cannot fully explain LBO's capital structure. They show that the conditions in the debt market heavily influence the level of leverage with respect to LBOs. These results are in line with the findings of Axelson et al. (2007) and Demiroglu and James (2007) for determinants of capital structure in LBOs taking place in the U.S.

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[224] Lowenstein (1985), Kaplan (1989a), and Frankfurter and Gunay (1992) argue that the wealth gains from LBOs are largely the result of interest tax shields related to the high leverage that underlies the transaction.

[225] They show that firms with simultaneously higher cash flows and lower Tobin's q are more likely to undertake an LBO, which is consistent with the free cash flow hypothesis. The same intuition is presented by Carow and Roden (1997). Additionally, they also show that firms with lower and, therefore, greater debt capacity, have higher abnormal returns.

3.3.6.3. Securitization and Issuer's Capital Structure

Hill (1996) argues that securitization can help to alleviate various costs introduced by market imperfections, like agency costs, bankruptcy costs, regulatory costs, and information costs. Along this line of reasoning, Jobst (2006a) argues that securitization may redress conflicts of interest between creditors and shareholders in the capital structure choice of firms, concerning possible agency costs from underinvestment [Myers (1977, 1984)] and asset substitution [Jensen and Meckling (1976)], due to excessive levels of debt or the presence of non-value maximizing investment behavior respectively. Thus, "*... issuers with high agency costs of debt and/or low prospects should be more likely to engage in asset securitisation.*"

3.3.6.4. Structuring Leasing and Tax Benefits

While there is extensive literature on leasing, most of it focuses on the differential tax position of the lessee and the lessor as the primary rationale for leasing [e.g. Bower (1973), Miller and Upton (1976), Brealey and Young (1980), Smith and Wakeman (1985), and Brick, Fung, and Subrahmanyam (1987)].[226] Miller and Upton (1976) conclude that no financial advantages can accrue from leasing. On the contrary, Lowellen, Long, and McConnell (1976) and Myers, Dill, and Bautista (1976) argue that, under a set of assumptions, there is a potential for gains for the firm involved in leasing because government can suffer a loss in taxes. The same line of reasoning is presented by Beattie et al. (2000). They argue that tax considerations is an important factor in the choice between debt and leasing, because leasing provides the option of 'selling' tax allowances to a lessor, in exchange for lower rental payments.

Caselli (2005) and Fabozzi et al. (2006) present the capture of tax benefits (including cross border tax loopholes)[227] as a reason for structured leasing. Caselli (2005) argues that "*... the tax variable becomes a powerful tool for creating economic maneuvering room to reduce the cost of capital for its users.*" Capturing tax benefits means taking

[226] Krishnan and Moyer (1994) present a very concise and complete literature review on this subject.

[227] Cross border leases are deals that are structured in a way that they take advantage of tax benefits in a country other than that in which the transactions takes place. As asserted by Caselli (2005), "*[T]his is achieved by using a vehicle company domiciled in other country, which assumes the role of lessee and them proceeds to rent the underlying asset to the effective lessee.*"

advantage of the differences in taxation between leasing and other forms of financing, with the aim of reducing lessee's cost of capital – reduction of the all-in cost. Fowkes (2000) analyses the use of leasing in project financing and argues that "*[L]ease finance can provide sponsors with significant accounting earnings and tax benefits.*"[228]

3.3.6.5. Concluding Remarks

In conclusion, a structured finance transaction is usually based on the incorporation of an SPV, exclusively for the transaction. This means that the SPV is the owner of the asset(s) and is then used to organize the operation in order to raise the funding needed to purchase the asset itself or to develop the project. Thus, the SPV is a key element for sponsors / originators to achieve (or maintain) certain capital structures without ceasing to invest in new investment projects or limit their operational capacity. Additionally, as all economic consequences generated by the initiative in question are attributed to this SPV, and both cash flows generated by the initiative and SPVs' assets are offered as collateral to creditors – debt repayment depends only or primarily on the assets and cash flows of the SPV, and not on the overall financial strengths of the originator – this leaves room for highly leveraged capital structures and incremental interest tax shields/savings.

3.3.7. Improve/Preserve Financial and Regulatory Ratios

The determinants of asset ownership and the boundaries of the firm have been a longstanding topic for economic research, going back at least to the seminal contribution of Coase (1937). When contracts are incomplete, financing an asset off-balance sheet or owning it does matter and involves numerous trade-offs.

[228] The author presents four motivations for combining leasing and project financing: (1) leasing may provide off-balance sheet treatment; (2) leasing can provide improvement in earnings; (3) leasing may allow a sponsor to maximize the tax benefits associated with ownership of the assets; and (4) a true leasing may provide an alternative source of funding at a lower cost.

3.3.7.1. Project Finance and Off-balance Sheet Financing

Nevitt and Fabozzi (2001) assert that preventing debt from showing on the balance sheet – so as not to impact financial ratios – is an important objective for the borrower, when using project finance. The off-balance sheet treatment of the funding raised by the SPV is crucial for sponsors, since it only has limited impact on sponsors' creditworthiness, and does not impact sponsors' ability to access additional financing in the future.[229] The same idea is presented by Gatti (2005), who asserts that the use of project finance may enable sponsors to obtain 'insurance' against any potential negative impact of the project. In 2008, Gatti focuses on two essential benefits: (1) separate incorporation and avoidance of contamination risk (the separation of large, risky projects in an SPV); and (2) preservation of financial ratios, since the debt raised by the SPV is not shown on the originators' balance sheet.

3.3.7.2. Securitization and Capital Arbitrage

As mentioned above, the main motivations for securitization can be discussed from the perspective of a nonbank corporation and from the perspective of a bank corporation. Fabozzi et al. (2006) argue that the improvement of the originators' key financial ratios is a common economic benefit referred to either a bank or nonbank corporation. As pointed out by Goldberg and Rogers (1988), "*... if the transaction is considered a sale of assets, firms can realize a gain (or a loss) upon sale, thereby accelerating income recognition.*" Additionally, by removing assets from balance sheet, securitization can improve a company's return on assets and return on equity ratios.[230]

Regarding bank corporations, several authors [e.g., Cumming (1987), Jones (2000), Fabozzi et al. (2006), and Krebsz (2011)] argue that securitization allows originators to benefit from regulatory and/or tax arbitrage. Krebsz (2011) refers to arbitrage as one of the key drivers behind an asset securitization transaction.[231] Fabozzi et al. (2006) point out the role of capital – banks can adjust their capital ratios by engaging in

[229] This advantage of project finance for sponsors is also presented in the literature by Shah and Thakor (1987), John and John (1991), and Chemmanur and John (1996).

[230] See, e.g., Roever and Fabozzi (2003), Fabozzi and Kothari (2007), and Krebsz (2011).

[231] According to the author, this means that the originator aims "*... to leverage an actual or perceived advantage it may have: this could be regulatory arbitrage […], informational arbitrage […], technological arbitrage […], or simply financial arbitrage.*"

securitization – as one of the main reasons for a bank corporation to issue asset-backed securities.[232] The use of securitization to reduce banks' capital requirements involves seizing the opportunity to arbitrage the regulatory capital required under the Capital Accord of 1998 – Basel I. Despite Basel II agreement (and the ongoing, forward looking Basel III), which came into effect in 2008, meeting some of the weaknesses of the Basel I Accord,[233] a major economic driver of a new securitization transaction persists; i.e., the applicable calculation rules (e.g., standardized approach vs internal ratings-based approach vs advanced ratings-based approach) highly influence the regulatory capital charge.

3.3.7.3. Structured Leasing and Financial Ratios

Comparing leasing with purchasing using borrowed funds, Fabozzi et al. (2006) present the credit capacity preservation as a motivation for selecting structured leasing. According to reporting standards for leases, a capital lease – a lease that transfer substantially all of the benefits and risks incident to ownership of property, should be accounted for as the acquisition of an asset and the incurrence of an obligation by the lessee (FASB Statement No. 13) – has to be capitalized as a liability and the equipment recorded as an asset on the balance sheet. Conversely, operating lease is not capitalized, and thus preserves credit capacity – the debt-to-equity ratio will be lower. Most long-term leases are structured to achieve the classification of operating leases for accounting purposes, and thus treated as off-balance sheet financing, which allows the lessee to preserve financial ratios.[234]

Focusing on synthetic leases, Weidner (2000) argues that these transactions improve balance sheet and ratios from which businesses are judged.[235] Similarly, Sandler (2000) presents the following benefits of off-balance sheet lease financing: (1) reduction in

[232] This idea is also presented by Donahoo and Shaffer (1991), Berger and Udell (1993), Duffie and Rahi (1995), Jagtiani et al. (1995), Carlstrom and Samolyk (1995), Berger et al. (1995), Jones (2000), Calomiris and Mason (2004), and Ambrose et al. (2005).
[233] As pointed out by Cardone-Riportella et al. (2010), concerning the Basel II agreement, "*... the possible reduction in the capital requirements is closely associated both with the quality of the underlying portfolio and with the amount of risk exposure retained by the originator entity, which prevents the possible arbitrage of capital.*"
[234] For further discussion of leasing classification for accounting purposes see Annex 3.
[235] When a lease is classified as an operating lease, the lessee does not depreciate the asset. This favorably impacts the price-to-earnings ratio and the earnings-to-assets ratio.

leverage ratio; (2) increase in return on assets; (3) increase in earnings and cash flows; (4) increase in tax deductions for long-life assets; and (5) the ability to generate additional earnings from reinvestment of capital otherwise invested in leased assets.

3.3.8. Risk Management

3.3.8.1. Securitization as a Risk Management Tool

One of the main reasons for an originator to issue an asset-backed security is risk management. Rosenthal and Ocampo (1988) argue that "... *securitization transactions manage these risks* [credit, interest rate, and prepayment risks] *more explicitly, and therefore more efficiently, than does conventional lending* [… and…] *it makes these risks more transparent and it also allocates them far more precisely to the players who are best able to absorb them.*"

This idea is corroborated by Fabozzi and Kothari (2007), who argue that securitization is one of several corporate risk tools available to management. When assets are sold in a securitization, the originating company no longer bears the interest rate or credit risk of those assets. With regard to bank corporations, the literature presents risk management and the transfer of credit risk – securitization consists of one of the main instruments available to banks to transfer credit risk and to fund risky financial assets in order to minimize financial distress costs – as one of the main reasons behind securitization.[236]

Securitization leads to an improvement in the management of interest rate risk and credit risk [Hess and Smith (1988), and Rosenthal and Ocampo (1988)] if the originator securitizes its worst assets. However, securitization may also increase the level of risk if the bank securitizes its best assets; i.e., when the assets kept on-balance sheet are poorer quality assets [Murray (2005)]. With respect to interest risk management, Fabozzi (2005) points out that securitization allows financial institutions to securitize assets that expose the institution to a higher degree of risk and retain certain parts of the transaction to obtain a specific asset/liability position.

[236] See, among others, Goldberg et al. (1988), Fabozzi et al. (2006), Jobst (2006a), and Cardone-Riportella et al. (2010).

3.3.8.2. Project Finance and Risk Management

Brealey, Cooper, and Habib (1996) argue that project finance creates value by improving risk management.[237] This idea is corroborated by Esty (2003, 2004a, 2004b). Underinvestment problems due to distress costs and/or managerial risk aversion [Stulz (1984)] can be reduced through project finance transactions. The nonrecourse nature of project debt protects the sponsoring firm from risk contamination (i.e., when a failing project drags a healthy sponsoring firm into default or imposes increased distress costs on it). As asserted by Esty (2004b), project finance "*... allows the firm to isolate asset risk in a separate entity where it has limited ability to inflict collateral damage on the sponsoring firm; in essence, it allows firms to truncate large left-hand tail outcomes, which Stulz (1996) claims is the primary goal of risk management.*" Additionally, project finance creates value by improving risk management inside the project. Risks are allocated with the goals of reducing cost and ensuring proper benefits; i.e. they are allocated to the parties that are in the best position to manage them.

3.3.8.3. Structured Leasing and Risk Management

Concerning structured leasing, Caselli (2005) points out the risk transfer and risk management of the asset as one of the most important factors that stimulate the demand for these types of transactions. A structured lease (leverage lease or synthetic lease) is based on the establishment of an SPV exclusively for the transaction, which works as a key risk management device.[238] In both structures – the SPV acts as an owner (leverage lease) or as a lessor (synthetic lease) of the assets – off-balance sheet operating lease treatment for the lessee under FAS 13 is achieved [Fowkes (2000)]. Contrary to a synthetic lease, in a leveraged lease all of the risks are substantially transferred to the

[237] A stream of research interprets project finance as one of the risk management strategies taken by sponsors. For example, Chemmanur and John (1996) argue that project finance can be used as a bankruptcy protection device of a low-risk project from high-risk projects. Corielli et al. (2010), using a sample of almost 1,000 project finance loans, find that lenders "*... rely on the network of nonfinancial contracts as a mechanism to control agency costs and project risks.*"

[238] With a leveraged lease, which is structured as a lease for tax purposes, the tax benefits of depreciation and interest deduction are retained by the lessor but partially passed back to the lessee through lower rents. A synthetic lease is an operating lease for accounting purposes but structured as financing for tax purposes.

lessor. For tax purposes, a synthetic lease is structured so that the lessee may reclaim that it is, in substance, the owner of the encumbered property.

3.3.9. Financial Flexibility

3.3.9.1. Project Finance and Financial Flexibility Preservation

To understand the motivations for using project finance, we need a thorough understanding of why the combination of a firm plus a project might be worth more when financed separately with nonrecourse debt (project finance) than when they are financed jointly with corporate funds (corporate financing).[239] If the project to be implemented represents a significant part of the sponsor's assets, its implementation will increase debt and the cost of future credit lines, and eventually preclude future initiatives with a positive NPV. By using project finance – an off-balance sheet structured deal – the funding concerns an *ad hoc* legal entity involving no or limited recourse to the sponsor. Thus, project finance is of great demand when it does not have a substantial impact on the balance sheet or the creditworthiness of the sponsoring entity or entities.

Fabozzi et al. (2006) argue that "*[T]he ultimate goal in project financing is to arrange a borrowing for a project that will benefit the sponsor but at the same time have absolutely no recourse to the sponsor, and therefore no effect on its credit standing or balance sheet.*" They point out the following benefits regarding financial flexibility when segregating a financing operation as a project financing: (1) improvement in the return of the capital invested in the SPV through leverage; (2) maintenance of the originator credit terms; (3) prevention of regulatory problems affecting the sponsor; and (4) costs segregation for regulatory purposes. The same idea is presented by Nevitt and Fabozzi (2001). They assert that project finance transactions provide financial flexibility to originators because each one or a combination of the following objectives may be achieved: (1) protection of credit rating; (2) suppress debt on the balance sheet; (3) limit

[239] A sponsor can select to finance a new investment project using two alternatives: (1) the new project is financed on-balance sheet – corporate financing; (2) the new project is financed off-balance sheet by incorporation into a newly created economic entity (SPV) – project financing. See Gatti (2008) for further discussion of the main differences, advantages, and disadvantages between corporate financing and project financing.

direct liability to a certain period of time so as to avoid a liability for the remaining life of the project; and (4) avoid restrictive covenants in an indenture or loan agreement which might preclude direct debt financing or leases for the project.

3.3.9.2. Structured Leasing and Financial Flexibility

Fabozzi et al. (2006) present financial flexibility via working capital protection and fewer restrictions on management as important factors that stimulate the demand for structured leasing transactions. According to the authors, one of the advantages of leasing against borrowing to purchase equipment is that "*... a lease agreement typically does not impose financial covenants and restrictions on management.*" Regarding working capital protection, contrary to borrowing money to purchase equipment, leasing usually provides an amount equal to the entire price of the equipment. In addition, costs incurred to acquire the equipment (e.g., delivery and installation charges) can be included in a lease agreement.

3.3.9.3. Securitization and Financial Flexibility

Securitization can be defined on the basis of three key characteristics: (1) pooling of assets; (2) tranching of liabilities that are backed by the asset pool; (3) de-linking of the credit risk of the collateral asset pool from the credit risk of the originator, usually through use of a finite-lived, standalone special purpose vehicle (SPV). This means that the SPV becomes the owner of the assets, which is then used to organize the operation in order to raise the funding needed. Thus, securitization is a reliable and relatively unconstrained source of off-balance sheet financing that allows issuers to raise funds and improve their liquidity position without increasing their on-balance sheet liabilities and capital base.

According to Goldberg and Rogers (1988), by removing assets from balance sheet, securitization can improve a company's return on assets and return on equity ratios. The same line of reasoning is presented by Roever and Fabozzi (2003), Fabozzi and Kothari (2007), and Krebsz (2011). These authors argue that securitization allows financial institutions to improve/preserve financial and capital ratios, thus increasing its financial flexibility.

3.4. Problems Related to the Use of Structured Finance

Despite the previously mentioned economic benefits for sponsors and investors, structured finance transactions also have disadvantages, especially when used inappropriately. Considering the available literature in the field of structured finance, we have identified the following problems related to the use of structured finance transactions, which will be further developed in the next sections: (1) complexity; (2) off-balance sheet treatment; (3) asymmetric information problems; (4) agency problems; (5) higher transaction costs; and (6) wealth expropriation.

Table 3.3 interrelates the mentioned problems (or disadvantages) with the main structured finance instruments; i.e., securitization,[240] project finance,[241] LBOs,[242] and structured leases.[243]

[240] The most commonly referred disadvantages of securitization are: (1) complexity [e.g., Davidson et al. (2003), Caselli and Gatti (2005), Fender and Mitchell (2005), Fabozzi et al. (2006), and Jobst (2006a)]; (2) off-balance sheet treatment [e.g., Fabozzi et al. (2006) and Rutledge and Raynes (2010)]; (3) asymmetric information problems [e.g., Gorton (2009), Jobst (2009), Lupica (2009), and Krebsz (2011)]; (4) agency problems [e.g., Alles (2001), Jobst (2006a), Fabozzi and Kothari (2007), and Jobst (2009)]; and (5) higher transaction costs [e.g., Davidson et al. (2003) and Cardone-Riportella et al. (2010)]. See Annex 1 for further discussion of the disadvantages of securitization.

[241] Critics of project finance argue that this type of structured finance transactions has the following problems: (1) complexity [e.g., Esty (1999, 2004a), Caselli and Gatti (2005), and Fabozzi et al. (2006)]; (2) off-balance sheet treatment [e.g., Fabozzi et al. (2006)]; and (3) higher transaction costs [e.g., Esty (1999, 2004a), Fabozzi et al. (2006), and Gatti (2008)]. See Annex 2 for further discussion of project finance disadvantages.

[242] The most commonly referred disadvantages of LBOs are: (1) complexity [e.g., Caselli and Gatti (2005) and Fabozzi et al. (2006)]; (2) asymmetric information problems [e.g., Kaplan and Strömberg (2009) and Cumming and Zambelli (2010)]; (3) higher transaction costs [e.g., Roden and Lewellen (1995) and Cumming and Zambelli (2010)]; and (4) wealth expropriation [e.g., Opler and Titman (1993), Kaplan and Strömberg (2009), and Cumming and Zambelli (2010)]. See Annex 4 for further discussion of the problems of using LBOs.

[243] Critics of structured leases argue that the limitations of these off-balance sheet transactions are: (1) complexity [e.g., Caselli and Gatti (2005) and Fabozzi et al. (2006)]; (2) off-balance sheet treatment [e.g., Caselli and Gatti (2005)]; (3) higher transaction costs [e.g., Caselli and Gatti (2005) and Fabozzi et al. (2006)]; and (4) wealth expropriation [Wanzenboeck (2001) and Altamuro (2006)]. See Annex 3 for an overview of the disadvantages of structured leasing transactions.

		Structured Finance Transactions			
		LBOs	Project Finance	Securitization	Structured Leasing
Problems Related to the Use of Structured Finance	Complexity	■	■	■	■
	Off-Balance Sheet Treatment		■	■	■
	Asymmetric Information Problems	■		■	
	Agency Problems			■	
	Higher Transaction Costs	■	■	■	■
	Wealth Expropriation	■			■

Table 3.3: Problems related to the use of structured finance.

Structured finance transactions are fairly complex and involve a significant amount of cash flow evaluation, due diligence, negotiation, and legal procedures. Consequently, structuring such a deal is more costly than corporate financing. Table 3.3 corroborates this idea as complexity and higher transaction costs are problems or disadvantages common to all of the structured finance transactions.

Moreover, it can be said that there is a broad consensus that securitization played an important role in the development and propagation of the 2007/2008 financial crisis.[244] Hence, the main problems of securitization transactions are essentially presented within the context of the recent financial crisis.

3.4.1. Complexity

It is commonly agreed that structured finance instruments are complex *vis-a-vis* straight debt finance transactions or products [see, e.g., Fabozzi et al. (2006)]. The risk and return evaluation of a structured finance instrument requires modeling the risk of the underlying assets, which can be particularly difficult if the asset pool is composed of heterogeneous assets (e.g., in securitization) or if the SPVs' cash flows are difficult to measure (e.g., in project finance). Additionally, it is necessary to evaluate the deal's specific features, including how the cash flows will be distributed to the tranches or loans, the main covenants presented in the transaction, the rights and duties of various parties involved, and the elected credit enhancement mechanisms.

[244] See, among others, BIS (2008), IMF (2008b), Benmelech and Dlugosz (2009), and Brunnermeier (2009). For further discussion of the role of securitization in the 2007/2008 financial turmoil see section 3.5.

Fender and Mitchell (2005) argue that the increasing complexity of structured finance products creates incentives to rely more heavily on ratings than for other financing instruments. Although they are useful, structured finance ratings have limitations that market participants and public authorities need to take into account in their assessment of structured finance instruments and their markets. Thus, despite the fact that structured finance products can contribute to market completion and a better dispersion of risk, they also have limitations with potential financial stability implications.[245] This idea is corroborated by Fabozzi et al. (2006), who point out that "*... the increasing complexity of the structured finance market and the ever growing range of products being made available to investors are invariably creating challenges in terms of efficient information assembly, management, and dissemination.*"

Asset securitization transactions are fairly complex and involve a significant amount of due diligence, negotiation, and legal procedures. As referred by Davidson et al. (2003), "*[A] first transaction from an originator can take anywhere from 1 to 2 years to complete* ...." This idea is corroborated by Jobst (2006a), who presents the structural complexity of securitization as the main drive for the principal concerns about this type of structured finance, which are: (1) high concentration of interest rate risks; (2) the potential for errors in the rating and pricing of complex security designs; and (3) the shortcomings of analytical models in assessing risks.

Regarding project finance, Fabozzi et al. (2006) present complexity, in terms of designing the transaction, writing the required documentation, and the patience and time required for designing financing and operating agreements, as one of the main disadvantages of project finance.

3.4.2. Off-Balance Sheet Treatment

Another common problem relates to the fact that many structured finance transactions are limited-recourse rather than nonrecourse, and thus there is a potential grey area in which accounting rules allow off-balance sheet treatment, but there is nonetheless some

245 With regard to the 2007/2008 financial crisis, the following limitations of securitization transactions can be pointed out: (1) their features lead to different agencies' rating methodologies; (2) their tranches are generally tailored to achieve desired ratings; and (3) the process of rating these instruments is based on an issuer-pays model – which raises questions about the possible existence of conflicts of interest.

contingent liability to the parent company´s shareholders. The off-balance sheet treatment is a key concept when we are referring to structured finance. However, the terms nonrecourse and off-balance sheet should remain synonyms, which does not always happen.[246] Liabilities having effective no recourse to a company´s shareholders can justly be treated as off-balance sheet.

The ability to finance a corporation off-balance sheet by issuing structured securities starts, not with finance, but with legal procedures. As asserted by Rutledge and Raynes (2010), "*... unlike the economics analysis underlying off-balance-sheet finance, which is internally consistent because it is mathematical, the legal theory of off-balance-sheet finance has yet to be formalized. The law is piecemeal, relatively unexamined and disconnected from the economics.*" Within securitization it has become at some point impossible for investors to understand where they have recourse to the borrower plus some assets held in a trust for it (a pledge), and where investors have no recourse to the borrower but agree to be repaid strictly from cash flows appending to some assets held in trust on its behalf (a sale). A fundamental question remains at the heart of the debate: to whose balance sheet do some SPVs append?

Fabozzi et al. (2006) issue a warning related to the use of structured finance, namely the use of SPVs to manipulate accounting statements and commit fraud, and to reduce transparency and disclosure. Even in the absence of fraud, the transfer of assets to SPVs may mislead investors as to the extent of nonrecurring earnings or deferred losses. To name an example, the authors mentioned that Enron pushed beyond the legal and ethical boundaries of structured finance.[247]

The most commonly mentioned disadvantages of structured leases are the costs of opacity related to the identification of whose balance sheet (lessor or lessee) does some leased assets append [Caselli and Gatti (2005)]? For example, synthetic leases are operating leases for accounting purposes and financing operations for tax purposes; i.e.,

[246] There is an increased need for the transactions that have significant recourse to the sponsor to be put back on the balance sheet.

[247] According to Fabozzi et al. (2006) "*[T]he immediate cause of Enron bankruptcy was a loss of confidence among investors caused by that company´s restatement of earnings and inadequate, misleading disclosure of off-balance sheet entities and related debt.*" Project finance is a method of monetizing cash flows, sharing and transferring risks, and is based on transparency. The Enron transactions had none of these characteristics. They attempted to arbitrage accounting, taxes, and disclosure. For further discussion of how the Enron debacle affected project finance and the broader realm of structured finance see Davis (2002).

they are off-balance sheet leases, in which the lessee remains the owner of the financed assets and retains the tax benefits associated with ownership, while simultaneously enjoying the benefits of an operating lease – the lessor offers the lessee a lower lease rate because the equity investor passes a portion of his tax benefit back to the lessee in the form of reduced lease payments.[248]

3.4.3. Asymmetric Information Problems

Gorton (2009) argues that a potential important problem is the loss of information when high complex structures are used to implement a securitization transaction. In the presence of asymmetric information, originators and issuers might be tempted to pursue their own economic incentives, which imposes substantial agency cost on efficient asset securitization.[249] Asymmetric information problems can come from (1) the information advantage of the originator with regard to the quality of borrowers and the historical performance of individual asset exposures – adverse selection; and (2) the complex security design of securitized assets, which suggests superior information of arrangers concerning the true value of issued securities. As declared by Jobst (2009), "*[T]he cause of the* [2007/2008] *crisis can be traced to market failure stemming from conflicts of interest in the securitization process and ill-designed mechanisms to mitigate the impact of asymmetric information.*"

Krebsz (2011) corroborates the idea presented by Jobst (2009) and points out that "*[S]ome of these* [securitization] *deals were structured intentionally to achieve artificial symmetry of information, either by using structures that were so complicated that no one could really understand…*" The author defines this as an 'arbitrage of information'.[250] Similarly, Lupica (2009) argues that as complex securitization

[248] Another example is the leverage lease. For financial accounting purposes, a leverage lease (operating lease) is not disclosed in the lessee balance sheet as financial obligations; i.e., the lease equipment is not capitalized and the lease obligation is not shown as a liability on the balance sheet.
[249] Asymmetric information could lead to moral hazard on the part of the issuers (asset originators in true sale transactions) if their effort level before and after the issue date is not incentive compatible with investor interests.
[250] In securitization transactions, one can identify three main types of arbitrage mechanisms: (1) timing arbitrage – someone receives funds that legally belong to somebody else but is contractually required not to pass on these funds immediately; (2) information arbitrage – somebody has more information available than someone else and may be tempted to act on the basis of this knowledge; (3) different regulatory treatments – e.g., different regulatory rules used for banks using standardized or foundation approach vs.

transactions have become ever more usual, information asymmetries between issuers and investors have grown larger.[251] In the absence of a proper comprehension and valuation of securitized assets, the credit ratings will become based on misjudgments, which in turn determine the failure in determining the price of these types of securities.

Coval et al. (2009) focus on economic catastrophe bonds and investigate the pricing and risk of instruments created as a result of recent structured finance activities.[252] They argue that there is an asymmetric information problem in senior CDOs[253] tranches. When compared with single-name counterparts, senior CDOs tranches should demand a different risk premium, as they have significantly different systematic risk exposures from credit rating. The author suggests that investors receive inadequate information from credit rating agencies for pricing senior CDOs tranches. Fons (2008) also points out that the failure of rating agencies to signal, in a timely and accurate way, the conditions of many securities backed by subprime housing loans was caused by the conflicts of interest posed by rating agencies' 'issuer-pays' business model.[254]

Empirically, Downing, Jaffee, and Wallace (2009) confirm the existence of asymmetric information problems. Based on a dataset of MBSs issued between 1991 and 2002, they find that informed originators trade lemons in the mortgage market; i.e., the assets sold to the SPV are of lower quality compared to the assets retained on the balance sheet.[255]

Kaplan and Strömberg (2009) illustrate some of the arguments presented by critics of LBOs. They assert that LBOs take advantage of superior information, but do not create economic value; i.e., LBOs benefits are only induced by private equity investors' superior information on future company performance – incumbent management is a

the internal ratings based approach which leads to the application of different multiplication factors when calculating the required capital reserve.

251 Lupica (2009) argues that this can lead to further failings in the fundamental structuring of transactions, with, for example, senior tranches' fallibility far greater than their rating suggests.

252 Bonds that default only under severe economic conditions. Coval et al. (2009) show "*... that many structured finance instruments can be characterized as economic catastrophe bonds.*"

253 For a description of CDOs see Annex 1.

254 This failure can be traced directly to two types of weaknesses: rating shopping (the opacity of rated securities is a common feature of structured finance markets and the rating agency generally does not have enough information to assign a rating) and regulation.

255 These results are contrary to the arguments presented by Greenbaum and Thakor (1987), Kohen and Santomero (1980), Kim and Santomero (1988), Flannery (1989), and Blum (1999). They argue that banks could have an incentive to securitize high-quality loans and to retain low-quality loans.

source of this inside information. The same line of reasoning is presented by Cumming and Zambelli (2010). They argue that the insider managers may hold private knowledge that can be used as insider information in other transactions.

3.4.4. Agency Problems

The credit crisis of 2007/2008 has somewhat tarnished the previously prevailing positive image of securitization, as a process to help remedy deficiencies in financial markets, arising from incomplete capital allocation. Several authors [e.g., Alles (2001), Jobst (2006a), Fabozzi and Kothari (2007), and Jobst (2009)] argue that securitization may lead to a severe principal-agent problem where the firm, who originates the assets to be ultimately sold and securitized, retains little or no interest in the pool of securitized assets. In this case, the originator does not have the same incentive to pay attention to the creditworthiness of its customers, as would be the case when the assets remain on its balance sheet. This idea is corroborated by Shin (2009), who asserts that the distorted incentives verified at all stages of the securitization process allowed the loans with high credit risk to pass through the financial system, and to be held in the portfolios of unsuspecting final investors. Similarly, Fabozzi and Kothari (2007) assert that "*[G]iven the ability of lenders to pass along subprime loans into the capital markets via credit enhancement […] lenders have been viewed by critics of securitization as abandoning their responsibility of evaluating the creditworthiness of potential borrowers.*" Finally, Jobst (2009) presents the market failure stemming from conflicts of interest in the securitization process as one of the major causes of the crisis.

Empirically, this idea is corroborated by Titman and Tsyplakov (2010). They show that poorly performing originators are more willing to originate riskier mortgages because they have less incentive to carefully evaluate the credit quality of prospective borrowers.

3.4.5. Higher Transaction Costs

As argued by Davidson et al. (2003), "*[S]ecuritization is quite costly in terms of up-front and ongoing fees compared to other types of financing.*"[256] This idea is corroborated by Cardone-Riportella et al. (2010), who point out that the disadvantages of securitization include the fixed costs of setting up the SPV.

According to Fabozzi et al. (2006), one of the major disadvantages of project finance is the higher cost of borrowing when compared to conventional financing.[257] As pointed out by Esty (2004a), "*[Y]et project finance also has some very serious drawbacks – it is expensive to set up, it takes a long time to execute (i.e., the transaction costs are very high), and it is highly restrictive once in place…*"[258] Similarly, Gatti (2008) argues that the principal drawback of project finance is that structuring such a deal is more costly than corporate financing. The author presents the following reasons: "*1. The legal, technical, and insurance advisors of the sponsors and the loan arranger need a great deal of time to evaluate the project and negotiate the contracts term to be included in the documentation; 2. The cost of monitoring the project in process is very high; 3. Lenders are expected to pay significant costs in exchange for taking on greater risks.*"[259]

One of the most frequently mentioned disadvantages of structured leases are the costs of complexity [Caselli and Gatti (2005)]. This idea is corroborated by Fabozzi et al. (2006), who state that a structured lease is similar to a single-investor lease – in terms of equipment selection and negotiation (rentals, options, responsibility for taxes, insurance, and maintenance) – but appreciably more complex in size, documentation, legal involvement, and, most importantly, in the number of parties involved and the unique advantages that each party gains.

[256] Davidson et al. (2003) estimates, for a Euro 100 million transaction in Europe, that these costs add to the overall financing costs about 15 to 50 basis points, assuming a 7-year bullet financing.
[257] The same idea is presented by Esty (1999). The author says that "*[N]egotiating the deal, including the financial, construction and operating contracts, is extremely time-consuming and expensive.*"
[258] Esty (2003) estimates transaction costs to be around 5% of the deal value.
[259] Despite some counter-intuitive features of project finance when compared to corporate financing (e.g., the creation of a stand-alone company takes more, entails greater transaction costs, higher leverage increases the probability of default, and, in most cases, this implies higher debt rates), Esty (2004b) argues that, in practice, "*… the individual structural components fit together in a very coherent and symbiotic way, and can reduce the net financing costs associated with large capital investments…*" Similarly, Bonetti et al. (2010) state that "*… a cost/benefit analysis reveals that the additional expenses are more than compensated for by the advantages that arise from off-balance sheet financing and appropriate risk allocation.*"

With respect to LBOs, although high leverage enables the reduction of agency costs between managers and shareholders and increments tax shields, the inflexibility of the required payments increases the chance of costly financial distress [Cumming and Zambelli (2010)]. Based on LBOs transactions, Roden and Lewellen (1995) argue that the financing decision to be taken by the buyout group will involve a trade-off between leverage-related costs (agency costs of high levels of debt financing and bankruptcy costs) and leverage-related benefits (disciplining effect of debt on management and the value of tax shields provided by the debt).

In short, higher leverage in a structured finance transaction usually induces up-front and ongoing fees which are relatively higher, when compared to straight debt finance transactions.

3.4.6. Wealth Expropriation

Miller and Upton (1976) conclude that no financial advantages accrue from leasing. Lowellen, Long, and McConnell (1976) and Myers, Dill, and Bautista (1976) argue that, under a set of assumptions, there is a potential for gains in valuation for the firm involved in leasing, resulting from tax benefit expropriation (government bears a loss in taxes). According to Altamuro (2006), critics of structured leases argue that the economic benefits of these off-balance sheet transactions "*... are the result of short-sighted opportunistic behavior by managers that lead to wealth extraction at the expense of other groups of stakeholders.*" Finally, some authors [e.g., Wanzenboeck (2001)] argue that, in cross-border leasing, the wealth expropriation phenomenon is greater, essentially when the leasing is structured based on the interposition of a trust between the lessor and lessees. In this case, the tax benefits produced are duplicated.

Kaplan and Strömberg (2009) assert that LBOs take advantages of tax benefits, but do not create economic value. The same idea is presented by Opler and Titman (1993), who point out that "*[C]ritics of LBOs argue that most of the gains to equityholders arise because of tax savings (see Lowenstein (1985)) and the expropriation of nonequity stakeholders (e.g., employees and bondholders) and have expressed concern about the* *effect of financial distress…*"[260] Cumming and Zambelli (2010) corroborate the intuition of Opler and Titman (1993) and assert that the current criticism of LBOs is associated with: (1) the potential negative impact on the acquired company; (2) the inside information held by managers; and (3) private equity financed LBOs may weaken the target firms and kill jobs.[261] More recently, particular criticism has been directed at the so-called club deals.[262] Officer et al. (2010) find that "*… target shareholders in club deals receive significantly lower premiums than sole-sponsored LBOs and other merger and acquisition transactions.*" This may be the result of private equity partnerships colluding to depress prices by limiting the number of competing bidders in an auction for a takeover target.

3.5. Structured Finance and Financial Crises

3.5.1. Financial Crises

"*Financial crises are major disruptions in financial markets characterized by sharp declines in asset prices and firms failures.*"

Frederic Mishkin (2010)

The expression financial crisis is roughly applied to a multiplicity of situations in which financial institutions or assets rapidly lose a huge part of their value. In the 19th and early 20th centuries, many financial crises were associated with banking panics, and many recessions coincided with those panics. A well-functioning financial system allocates capital to its most productive uses and solves asymmetric information problems. It is widely accepted [see, e.g., Mishkin (2010)] that financial crises occur when an increase in asymmetric information, as a result of a disruption in the financial

[260] Asquith, Gertner, and Scharfstein (1991), Kaplan and Stein (1993), and Opler (1993) developed academic studies of bankruptcy costs and bankruptcy cost reduction in highly levered transactions. These studies emerged because firms that did LBOs in the late 1980s incurred financial problems, which renewed concerns about potential financial distress costs created by these transactions.

[261] On the contrary, Amess and Wright (2007) present evidence that "*… LBOs, per se, do not destroy jobs and emphasize the need for more empirical evidence to better address the current international controversy surrounding LBOs.*"

[262] In a club deal, two or more private equity firms jointly sponsor an LBO.

system, causes severe adverse selection and moral hazard problems, making financial markets unable to channel funds in an efficient manner, from savers to households and firms with investment opportunities of positive net present value. Consequently, economic activity contracts sharply.[263]

A relationship can be established between financial innovation as the process of new securities design and financial crises. Gennaioli et al. (2010) point out that there is a common narrative in many episodes of financial innovation. First, investors (strongly) demand for a particular – often safe – stream of cash flows. Then, in response, intermediaries create new securities from risky assets offering the desired stream. Next, large amounts of new securities are issued because new securities are believed by investors (and by the intermediaries) to be good substitutes for the traditional ones – this is achieved through financial engineering. At some point in time, both investors and intermediaries are surprised, because previously unattended risks are reflected in the news, which is followed by a flight from 'false substitutes' to safe traditional securities. Finally, the prices of traditional securities rise, while those of new ones drop sharply. A recent example of this narrative is the securitization of mortgages, in which financial institutions created mortgage-backed securities, with an AAA rating, by means of pooling and tranching mortgages and other loans. Investors and intermediaries had the perception that these securities were safe and apparently good substitutes for U.S. government bonds. After trillions of dollars of securities were sold to investors, in the summer of 2007, both investors and intermediaries faced the news that the AAA-rated securities were not safe.[264]

However the recent episode, the international financial crisis that began in July-August 2007,[265] is far from unique. Other examples can be presented. Particularly, in the 1980s

[263] Mishkin (2010) presents six categories of factors that play important roles in financial crises: (i) asset market effects on balance sheets; (ii) deterioration in financial institutions' balance sheets; (iii) banking crisis – the contagion process underlying bank panics resulting from asymmetric information; (iv) increases in uncertainty – adverse selection problem, making lenders less willing to lend; (v) increases in interest rates; and (vi) government fiscal imbalances.

[264] As stated by Carow et al. (2010), "*[W]hat came as a rather complete surprise is how fast home prices declined, and defaults grew, so that even AAA-rated mortgage backed securities were affected. As these securities were downgraded, investors turned back to government bonds, and many financial institutions had to liquidate their holdings to reduce leverage, precipitating a financial crisis.*"

[265] When Bear Stearns liquidated two hedge funds that invested in mortgage-backed securities, BNP Paribas halted redemption in three investment funds supposedly investing in AAA-rated assets, the LIBOR-OIS spread exploded, and the market of asset-backed commercial paper collapsed.

investment banks began to sell CMOs and, in 2008, money market funds were seriously disrupted after the collapse of Lehman Brothers.

The global financial crisis, which started in 2007 – triggered by a liquidity shortfall in the U.S. banking system – has resulted in the collapse of financial institutions and the bailout of banks by national governments, and has revealed substantial transparency and information shortcomings, due to the increasing opaqueness and complexity of the global financial system. Considering that this has been particularly evidenced by uncertainty on the valuation and related ratings of structured products, a further analysis of the role played by structured finance instruments in the 2007/2008 financial crisis becomes crucial.

3.5.2. Structured Finance and the Subprime Financial Crisis

The subprime financial crisis was triggered by the exposure of financial institutions to the subprime mortgage market[266] and related financial instruments, which were primarily related to structured finance and, more specifically, to asset securitization.[267] Several authors pointed out that structured finance played a significant role in the development and propagation of the financial crisis.[268] As the IMF (2008a) states "... *the proliferation of new complex structured finance products, markets, and business models exposed the financial system to a funding disruption and breakdown in confidence*" and that particular products "... *exacerbated the depth and duration of the*

[266] Considered the most risky segment of the United States mortgage market. According to Kiff and Mills (2007) subprime mortgages are residential loans that do not conform to the criteria for 'prime' mortgages and so have a lower expected probability of full repayment, as they are made to more 'risky' mortgage borrowers. Standard and Poor's states that borrowers below A (credit rating) quality are considered subprime. See Gorton (2009) for a further description of subprime RMBS Bonds and CDOs backed by RMBS Bonds.

[267] According to Criado and Rixtel (2008) "*[A]s risk assessments were adjusted, the financial turmoil spilled over to other financial market segments and risky assets – particularly those linked to structured finance – were abandoned in favor of 'safe haven' instruments such as government debt securities.*" As pointed out by the authors, financial market turmoil showed the following characteristics: (i) stock prices fell; (ii) volatility levels jumped – particularly in the short-term money markets; (iii) interbank money market interest rates verified unprecedented rises; (iv) credit spreads increased; and (v) central banks injected substantial amounts of liquidity into the markets. The liquidity concerns that dominated the initial phase of the financial crisis were accompanied by credit risk concerns and transformed into crises of solvency related to major financial institutions when they started to report losses that were actually much larger than had been anticipated. For further discussion of financial turmoil see, for example, IMF (2008a and 2008b), BIS (2008), Borio (2008), and Mishkin (2010).

[268] See, among others, BIS (2008), IMF (2008b), Benmelech and Dlugosz (2009), Brunnermeier (2009), and Demyanyk and Van Hemert (2011).

crisis by adding uncertainty relating to their valuation as the underlying fundamentals deteriorated." The capability of structured finance to repackage risks and create 'secure' assets from a risky collateral lead to a rapid growth in the issuance of structured securities, most of which were perceived by investors as near risk-free financial assets.[269] During the financial crisis, it was discovered that these securities were actually far riskier than originally perceived by investors and certified by rating agencies.[270] As referred by Gennaioli et al. (2010), "*[W]hen investors or intermediaries perceive some securities to be safe, they would borrow using them as collateral, often with very low haircuts…*" But when investors and intermediaries realized that these securities were actually risky they would sell them, trying to meet their collateral requirements, leading to an additional fragility from fire sales.

Criado and Rixtel (2008) point out a set of weaknesses related with the use of structured finance, which were revealed by the financial turmoil, including: (i) banks underestimated their exposure to structured finance products and specific 'off-balance sheet' vehicles;[271] (ii) certain banks retained large exposures to specific structured finance instruments, such as collateralized debt obligations (CDOs) without sufficiently understanding their impact on capital and liquidity positions; (iii) banks resorted to more volatile funding sources including structured finance products;[272] and (iv) the process of securitization may have generated unwelcome incentive problems, considering that banks may not have accurately assessed the credit risk of borrowers, when they put their loans off-balance sheet using securitization techniques. The authors argue that asset securitizations, such as (subprime) mortgage-backed securities (MBS), asset-backed commercial paper (ABCP), 'cash flow' collateralized debt obligations (CDOs), and synthetic CDOs, played a central role in the development and propagation

[269] As referred by Coval et al. (2009), "*[A]s a result of the prioritization scheme used in structuring claims, many of the manufactured tranches are far safer than the average asset in the underlying pools.*"

[270] Structured finance, by virtue of diversification, tranching, and other forms of financial engineering created asset-backed securities (AAA-rated) that proved, during the financial crisis that started in 2007, to be false substitutes for the traditional and safe ones. In this case, false substitutes tend to lead to financial instability even without the effects of excessive leverage. For example, investors assumed that an AAA-rated bind issued by a European-listed company carried the same risk as an AAA-rated bond backed by a pool of assets.

[271] Which play an important role in this type of financing as suggested by Gorton and Souleles (2005). According to Lancaster et al. (2008) "*[T]hose SIVs that have been most affected by the market turmoil of 2007 are also those that are most heavily exposed to structured products, which also happens to be the newest SIVs in the market.*"

[272] When structured credit markets closed the funding capability of specific banks – such as Northern Rock in the United Kingdom – they were significantly impaired.

of the financial crisis. Additionally, Coval et al. (2009) state that securitization promotes the substitution of diversifiable risks for risks that are systematic or non-diversifiable. "*[A]s a result, securities produced by structured finance activities have far less chance of surviving a severe economic downturn than traditional corporate securities of equal rating.*"[273] The authors consider that the fragility of structured securities ratings and their high exposure to systematic risk are the main reasons for the impressive rise and subsequent fall of securitization.

Two major problems can be pointed out underlying the financial crisis: (i) asymmetric information problems, and (ii) agency problems [see, among others, Calomiris (2009)]. Although financial engineering has the potential to create securities and products that better match investors' needs, they also have hazards. The structured products like CDOs and squared CDOs (and other types of even more complex products)[274] can get so complex that it can be hard to determine the cash flows of the underlying assets and the value of issued securities. As asserted by Mishkin (2010), "*... the increased complexity of structured products can actually destroy information, thereby making asymmetric information worse in the financial system and increasing severity of adverse selection and moral hazard problems.*" Moreover, the originate-to-distribute business model, which lies behind the subprime mortgage market, is subject to the principal-agent problem, because the mortgage originator has little incentive to make sure that the mortgage is of good credit risk.[275] However, the agency problems become serious when the commercial and investment banks also have weak incentives to ensure that the ultimate holders of the securities would be paid for. The credit rating agencies

[273] The low capital requirements imposed on AAA-rated assets allowed banks to hold any senior tranches on their balance sheets. However, when the securitization market collapsed in late 2007, the investment banks found themselves holding hundreds of billions of dollars of low-quality assets pools.
[274] See Annex 1 for a detailed description of such instruments. Structured CDOs played a key role in the 2007/2008 financial crisis. As problems in the subprime mortgage markets in the United States mounted during the second and third quarters of 2007, CDOs based on mortgage-backed securities linked to the subprime market were negatively affected inflicting enormous losses on investors. Markets for these products dried up and as investors were not able to determine their losses, uncertainty grew in global financial markets and led to a spill-over of the financial turmoil to other financial market segments.
[275] In originate-to-distribute (O&D) business model, mortgages are originated by a separate party, typically a mortgage broker, and are then distributed to an investor as an underlying asset security. O&D model differs from originate-to-hold (O&H) banking model because with securitization, banks were no longer the originators and holders of loans, but had become the originators and distributors to the capital markets of both credit and risks.

evaluating these securities are also themselves subject to conflict of interest.[276] A similar idea is presented by Tavaloki (2008), who argues that the lack of appropriate due diligence (by rating agencies) and disclosure are the principal factors behind the financial crisis.

As a result of the international financial crisis, several authors asked if we should halt financial liberalization and innovation in order to prevent crises from recurring. Shiller (2008) argues that as financial innovation involves complicated financial arrangements, it can also create hazards. The sub-prime crisis has demonstrated the existence of problems still to be solved, like the implementation of stricter disclosure requirements for new securities and better-designed vehicles for hedging risks. When referring to the innovations associated to the sub-prime crisis, Shiller (2008) states that "*… we should not slow down financial innovation in general. On the contrary, some of the fixes that result from the sub-prime crisis will probably take the form of still more innovation, further increasing the sophistication of our financial markets.*" Similarly, Keys et al. (2010) argue that securitization is an important innovation and has several merits. However, the underlying assumption behind the argument that securitization improves the efficiency of credit markets is that there is no information loss between borrowers and investors. Hence, an increase in the 'skin in the game' and the reduction of the information loss are presented by Hull (2009) and Keys et al. (2010) as key factors for improving securitization transactions.

3.5.3. Concluding Remarks

It is commonly accepted that most credit is nowadays created using the originate-to-distribute model in which the originator of a loan sells it to someone (usually a special

[276] Credit rating agencies earn fees from rating securities and also from advising originators how to structure these transactions to get higher credit ratings. Additionally, "*[T]he position of oligopoly enjoyed by these firms reduces their incentives to compete by developing more effective ratings methods and procedures…*" [Herring and Kane (2009)]. In response to the criticism levied at credit rating agencies for having contributed to the financial crisis, regulators have been pressured to reform the way in which those agencies do business. The European Parliament recently issued a new regulation on credit rating agencies and their activities in Europe, which include new registration requirements, strengthened supervision by EU and nation authorities, new conduct-of-business rules and operational duties, as well as a new rating regime for structured finance investments.

purpose entity), who adds it to a portfolio of similar loans, and then issues new securities, holding a claim against the income provided by the loan portfolio. The transition from the traditional originate-to-hold model to the originate-to-distribute model, as well as its reliance on credit markets as a continuing source of credit, has been blamed by academics and practitioners for the financial crisis of 2007/2008. If the originator does not hold the credit it originates, but distributes the loan and its risks to other entities through securitization, the originator has a reduced incentive to monitor the credit granting process. Thus, this model brings with it a major principal-agent problem in the credit screening process, because the credit incentives of the originator are not aligned with those of the entity that ultimately holds the loan. When we add the growing complexity associated with the securitization process, the result is a 'market for lemons' problem [Akerlof (1970)], leading to the collapse of the market for securitized assets.[277] However, it should be put into perspective that securitized subprime mortgage backed securities only represent 6% of the approximately (at the end of 2007) $10 trillion asset securitization market. Thus, the rest $9.4 trillion of structured products have generally been stable quality securities, with rating transition matrices probabilities equal to or better than the corporate bond market [Lancaster et al. (2008)].

The asset securitization market, or at least some part of it, began to show some signs of recovery in 2008 and 2009. According to data from the Association for Financial Markets in Europe (AFME) and the European Securitization Forum (ESF), in 2008 and 2009, there were a few issues of ABS notes, approximately USD900bn of which have been issued in the U.S. and around USD65bn have been issued in Europe. The European Central Bank (ECB) and the Bank of England became two important players in these markets: around USD1,100bn of European ABS offers in 2008 and 2009 were taken by the ECB and around USD535bn by the Bank of England (source: Bloomberg). Krebsz (2011) asserts that "*[B]y mid-June 2010 there appears to be a thin but healthy pipeline of transactions lined up for issuance in the second half of this year and 2011*."

[277] As pointed out by Martin (2009), "*... securitization has grown to encompass increasingly more sophisticated and complex structures that make it difficult, if not impossible, to assess the value and risk of a particular security given the myriad of layers through which the security is connected to a particular mortgage, credit card receivable, or corporate loan or bond issue.*"

Since 2008, the Bank of International Settlements (BIS), the European Commission (EC), the International Organization of Securities Commission (IOSCO), the Committee of European Banking Supervisors (CEBS), the Committee of European Securities Regulators (CESR), the European Central Bank (ECB), the Bank of England, European Union national regulators, and the U.S. Securities and Exchange Commission (SEC) have been contributing to restore confidence in the securitization market.[278] The major recommendations are as follows [Krebsz (2011)]: (1) to improve pool information on U.S. and European RMBS into a more easily accessible and more standardized format; (2) to set up core market standards of due diligence disclosure practices for RMBS; (3) to strengthen and standardize the representations and warranties for RMBS; (4) to develop standard norms for RMBS servicing duties and evaluating servicer performance; (5) to improve independent third-party sources of valuation; (6) to restore market confidence in credit rating agencies by enhancing transparency in the rating process; and (7) to establish and enhance educational programs about securitization and structured products.

The crisis demonstrated that, in securitization, the value of the underlying cash flows varies with their repackaging, and that repackaging risk does not just eliminate it. Additionally, when market deterioration becomes systemic, SPVs may be unable to withstand market inertia, and triggers will eventually be breached – complex securitization products have introduced systemic risk into the financial system and maybe they have multiplied it. We can present some key factors that may help to overcome the shortcomings leading to the credit crisis, namely: (1) reduced complexity; (2) increased transparency; (3) increased standardization of transactions; (4) improved disclosure of underwriting standards; (5) increasing the alignment of incentives between originators and investors; (6) avoiding active rating shopping; (7) reduced overreliance on credit ratings; (9) increased risk management and risk mitigation; and (10) the need for investors to understand the benefits and drawbacks of arbitrage mechanisms.[279]

[278] See Krebsz (2011) for a comprehensive list of recommendations, as well as legislative and regulatory initiatives proposed by these entities.
[279] Tavakoli (2008) points out that "*[W]hat is needed is effective regulation. Until that occurs, investors will have to fend for themselves and practice the fundamentals of prudent lending and investing.*" A similar line of reasoning is presented by Krebsz (2011), who states that structured finance markets will

4. Research Questions and Data Description

4.1. Background Information

The primary purpose of this dissertation is to identify the common elements of various types of structured finance transactions and examine their economic advantages; i.e., *why structured finance matters?* This can be achieved by identifying the motivations behind structured finance transactions *versus* straight debt finance transactions. In fact, despite its use on a worldwide basis and several decades of history, a number of key issues regarding the specific determinants of structured finance, *vis-a-vis* other forms of financing, remain largely unresolved. This dissertation intends to provide a contribution to this research field of Corporate Finance.

From the previous literature discussion, we can highlight two core economic benefits provided by structured finance. The first motivation relates to the fact that structured finance enables the financing of a unique asset class when established forms of external finance are either (i) unavailable for a particular financing need, or (ii) less expensive than traditional sources of funds. The second economic benefit is the reduction in the cost of funding (e.g., through lower yield on issued debt). If the benefits of the reduced cost of funding are greater than the cost of the credit enhancement, making use of a structured basis is advantageous for sponsors – any transaction that is specifically structured using an SPV and is secured by ring-fencing assets producing cash flows solely for supporting the transaction, allows the issuer to obtain better credit ratings and/or leverage than it would by issuing senior secured debt.[280] Therefore, the core issues that will be investigated are the aspects that characterize these types of financing structures and distinguish them from straight debt finance transactions, with particular emphasis on examining the pricing factors affecting their cost of funding in Western European countries.

If structured finance (SF) instruments or transactions allow the reduction of funding costs, then the rates charged on SF transactions (or tranches) should be lower than the

grow again if some fundamental changes – namely standardization, transparency, and simplicity – are put in place.

[280] See, among others, Caselli and Gatti (2005), Davis (2005), Akbiyikli et al. (2006), Jobst (2007), and Tavakoli (2008).

rates charged on straight debt finance (SDF) transactions (or tranches).[281] Due to the difference in underlying risks, the relevant pricing factors for these two types of debt instruments should also differ. Four objectives are thus pursued in the dissertation. First, the pricing factors of SF transactions are identified and compared to pricing factors of SDF transactions. Second, the credit spread on SF is compared to the credit spread on SDF (Chapter 4). Next, we perform an econometric analysis of the determinants of loan and bond pricing (credit spreads) for SF and SDF transactions to determine how borrower, transaction-specific factors, and economic factors influence credit spreads (Chapter 5). Finally, we determine the factors which influence the choice between the use of SF and SDF transactions (Chapter 6).

Few researchers have studied these topics, so we will need to develop many of the testable hypotheses on our own. While Kleimeier and Megginson (2000) compare the spread and the common pricing factors of project finance loans with other syndicated loans, Sorge and Gadanecz (2008) compare the term structure of *ex ante* project finance credit spreads with non-project finance loans and bonds.[282] Vink and Thibeault (2008) examine if the primary market spreads associated with ABS, MBS, and CDOs are influenced differently by common pricing factors. Our study is the first to investigate how common pricing factors compare among and between SF (project finance loans and asset securitization bonds) and SDF transactions (corporate bonds).[283]

This chapter is structured as follows. Section 4.2. describes the research questions employed in this study. Section 4.3. includes a sample description followed by section 4.4. which describes the statistical results.

[281] Kleimeier and Megginson (2000) find that project finance loans have lower spreads than many other types of syndicated loans. Considering project finance deals, Corielli et al. (2008) assert that "... *the credit risk premium required by lenders should be lower in deals where effective risk management through a pervasive set of NFCs is in place as compared to those deals with poor risk management..:*" We intend to examine whether this conclusion remains valid not only when compared with other SF transactions, but as well as with SDF transactions.

[282] Esty and Megginson (2003) define lending syndicates as "*... pyramids with a few arranging banks (arrangers) at the top and many providing banks (providers) at the bottom.*" See Gorton and Pennachi (1995), Esty (2001), and Esty and Megginson (2003) for a more detailed description of syndicated loans.

[283] We draw mainly on loan pricing studies and their methodologies presented in, among others, Kleimeier and Megginson (2000), Blanc-Brude and Strange (2007), Gatti el al. (2007), Corielli et al. (2008), Sorge and Gadanecz (2008), and Vink and Thibeault (2008).

4.2. Research Questions and Methodology

In general, debt capital markets are roughly composed of two major types of financial instruments: straight debt finance (SDF) and structured finance (SF) instruments. Due to the differences in the structure and warranties related to these two types of transactions, their relevant pricing factors should differ as well. This raises the following three questions: (1) *How common pricing factors compare between SF and SDF transactions (or tranches)*? (2) *Is the credit spread on SF transactions (or tranches) significantly different to the credit spread on SDF transactions (or tranches)*? And (3) *to what extent are SF and SDF transactions (or tranches) priced by common factors*?

In short, three hypotheses are tested with respect to SF pricing. First (Hypothesis 1 and Hypothesis 2) we want to argue that not only the credit spread but even the common pricing factors differ significantly between SF and SDF transactions. The third hypothesis states that the primary market credit spreads associated with SF and SDF transactions are influenced differently by common pricing factors.[284] Generally, it is proposed the following hypothesis:

Hypothesis 1: The pricing factors of SF credit spreads do not differ significantly in relevance from the pricing factors of SDF credit spreads.

Hypothesis 2: The credit spread on SF is lower than or equal to the credit spread on SDF.[285]

Hypothesis 3: The impact of pricing factors on credit spread do not differ significantly among and between SF and SDF transactions.

[284] In this dissertation we use the issuance credit spread (or the tranche spread at closing). Kleimeier and Megginson (2000), Blanc-Brude and Strange (2007), Gatti et al. (2007), Vink and Thibeault (2008), and Sorge and Gadanecz (2008), among others, use the same variable. Vink and Thibeault (2008) argue that it is commonly recognized that issuance spreads are a more accurate measure of the risk premium demanded by investors.

[285] Caselli and Gatti (2005), Fabozzi et al. (2006), and Tavakoli (2008), among others, point out the reduction of funding costs as one of the major economic motivations of structured finance transactions. The same intuition is presented by Davidson et al. (2003), Roever and Fabozzi (2003), Fabozzi et al. (2006), Jost (2006), and Fabozzi and Kothari (2007) for asset securitization. According to Esty (2003) and Gatti (2005), the use of project finance may enable sponsors to obtain a reduction in the net cost of financing. For further discussion of this issue see sub-section 3.3.2.

The purpose of answering the first and the second question is to provide extensive insight into the common characteristics and pricing factors associated with SF and SDF financial instruments and to elaborate on any substantial differences between them. In testing Hypotheses 1 and 2 we use a parametric test (*Student's t-test*) for continuous variables and a non-parametric test (*Fisher's exact test*) for dummy variables, to compare whether the distribution of the reported values for SF and SDF tranches are significantly different. This analysis is presented in section 4.4.

The third hypothesis states that various different variables determine the credit spread, and it may well be that the impact of these variables on the credit spread is different among and between SF and SDF transactions; i.e., in pricing transactions, the pricing factors may have a different impact on the credit spread exhibited by the value of the coefficients. Furthermore, the degree of impact on the spread could differ from one financial instrument class to another. In testing Hypothesis 3, a structural change test is used. The Chow test is an econometric test used to determine whether the coefficients in a regression model are equal in separate subsamples [Chow (1960)].[286] Having documented to what extent the pricing variables for SF and SDF transactions show significant differences, we continue our empirical analysis by examining the factors impacting on the pricing of tranches. We use an ordinary least squares regression analysis to model the magnitude of the relationships between pricing variables and the credit spread with the expectations as outlined in sub-section 5.3.2. Should Hypothesis 3 be rejected, examining the coefficients allows us to determine pricing variables for each class separately. Should Hypothesis 3 be accepted, a regression test would have to be run on one sample only.

Finally, the significant role played by the 2007/2008 financial crisis[287] in a number of business failures, the decline in consumer wealth, and the downturn in economic

[286] See Davidson and Mackinnin (1993) for further discussion of this topic. In short, the Chow test is an econometric test used to determine whether the coefficients in two linear regressions on different data sets are equal.

[287] The global financial crisis that started in 2007 triggered by a liquidity shortfall in the U.S. banking system, has resulted in the collapse of financial institutions and the bailout of banks by national governments, and has revealed substantial transparency and information shortcomings due to the increasing opaqueness and complexity of the global financial system. According to Criado and Rixtel (2008), *"... this has in particular been evidenced by uncertainty on the size and distribution of the losses*

activity contributing to the European sovereign debt crisis[288] require a study of the impact of the global financial crisis on SF credit spreads. There is broad consensus about the important role played by SF transactions, especially asset securitizations, in the development and propagation of the 2007/2008 financial crisis.[289] As IMF (2008a) suggests "*... the proliferation of new complex structured finance products, markets, and business models exposed the financial system to a funding disruption and breakdown in confidence*" and that particular products "*... exacerbated the depth and duration of the crisis by adding uncertainty relating to their valuation as the underlying fundamentals deteriorated.*" These arguments raise one final question: *Is the credit spread on SF transactions (or tranches) significantly affected by the 2007/2008 financial crisis*? One final hypothesis is thus proposed:

Hypothesis 4: After controlling for macroeconomic conditions and loan characteristics, the 2007/2008 financial crisis does not have a significant impact on SF credit spread.

The purpose of answering the fourth question is to provide extensive insight into the impact of the 2007/2008 financial crisis and the subsequent European sovereign debt crisis on SF credit spread. Given that, since the second half of 2008 we have been observing considerable financial turmoil, a flight to quality might have left many investors and intermediaries in the Western European countries credit-rationed. Hence, SF borrowers and lenders might have also changed their attitude towards SF in terms of pricing and compensation. We are therefore examining whether the credit spread changes over time, by considering a pre-crisis period from January 1st, 2000 through to

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resulting from the subprime crisis and on the valuation and related ratings of structured products." Mishkin (2010) points out the mismanagement of financial innovation and the bursting of a housing price bubble as the underlying forces of the financial crisis.

[288] From late 2009, a sovereign debt crisis developed in Europe as a result of the rising private and government debt levels around the world together with a wave of downgrading of government debt in some European states. In several countries, private debts arising from a property bubble were transferred to sovereign debt as a result of banking system bailouts and government responses to slowing economies post-bubble [see, among others, Haidar (2012)].

[289] See, among others, BIS (2008), IMF (2008b), Benmelech and Dlugosz (2009), Brunnermeier (2009), and Demyanyk and Van Hemert (2011).

September 14th, 2008, and a crisis period from September 15th, 2008 (Lehman Brothers' bankruptcy filing date) through to December 31st, 2011.

4.3. Sample Selection

Our sample consists of individual loans and bond offers extracted from DealScan and DCM Analytics databases, respectively. DCM Analytics database (formerly Bondware database) is compiled by Dealogic[290] and offers comprehensive information of debt securities issued on the debt capital markets. DealScan database is provided by Thomson Reuters LPC, a primary market information provider of individual deal information on the global syndicated loan markets. Information is available on the micro characteristics of the loan and bond offers (e.g., transaction and tranche size, maturity, currency, pricing, rating, type of interest rate) and of the borrowers (e.g., name, nationality, industry sector).

The reason for using two databases is that we require information about the pricing characteristics of structured finance and straight debt finance transactions. In fact, while DCM Analytics provides very detailed information regarding corporate bonds (used as a proxy for straight debt finance transactions) and asset securitization, Dealscan has particularly rich data about project finance loans. We use asset securitization and project finance transactions as proxies for structured finance instruments.[291]

These databases contain detailed historical information on virtually the entire population of bond securities (DCM Analytics) and syndicated loans (DealScan) issued in the international capital markets from January 1st, 2000 through to December 31st, 2011. Although the database extracted from DCM Analytics contains information on several types of bonds, we include only those with a deal type code of “corporate bond-investment-grade”, “corporate bond-high yield”, “asset-backed security”, and

[290] Dealogic (formerly Capital DATA) was founded in 1983 and is based in London.
[291] As pointed out in section 3.2., one can identify four types of structure finance instruments; i.e., project finance, asset securitization, structured leasing, and leveraged acquisitions (mainly LBOs). We rely on project finance and asset securitization as structured finance instruments because: (i) there is no public information on structuring leasing transactions; and (ii) LBOs can be implemented without an SPV to facilitate the transaction, which is a key element of structured finance transactions.

"mortgage-backed security".[292] Bond tranches classified either as fixed rate bonds, with coupon rate information, or variable rate bonds, with both spread and index information were included in the data. For variable rate bonds, only those quoted on the following indices were included: Euribor, Euro Libor, USD Libor, and GBP Libor. Bonds with additional features such as step-up, caps, or floors were excluded. While Dealscan database contains historical information about syndicated loans and related banking instruments, we examine only loans with a deal specific purpose code of "project finance". We also require, for both databases, that the Borrower/Issuer country belongs to Western Europe[293] and that the tranche size (in Euro millions) be available. After applying these screens, we are able to examine a total of 24,435 debt issues (worth Euro 6,297.8 billion).[294]

Our sample contains information on 599 asset securitization issues (worth Euro 179.1 billion) – of which 430 issues (worth Euro 106.3 billion) have a deal type code of ABS and 169 issues (worth Euro 72.9 billion) have a deal type code of MBS –, 20,977 corporate bond issues (worth Euro 5,786.5 billion), and 2,859 project finance issues (worth Euro 332.1 billion).[295] We refer to this as our 'full sample'. We refer to the database composed of asset securitization and project finance issues as our 'structured finance full sample' and the database composed of corporate bond issues as our 'straight debt finance full sample'.

As the unit of observation is a single issue or a single loan tranche, multiple issues from the same transaction appear as separate observations in our database. Project finance

[292] We exclude bond issues, which have a deal type code of 'Medium-Term Note', 'Non-Us Agency', 'Covered Bonds', and 'Collateralized-Debt Obligation'. Perpetual bonds were also excluded from the database. The asset securitization market is composed of asset-backed securities (ABS), mortgage-backed securities (MBS) and collateralized debt obligations (CDOs). Due to the important role played by CDOs in the 2007/2008 financial crisis – CDOs based on mortgage-backed securities linked to the subprime market were negatively affected inflicting enormous losses on investors – and as CDO issues are frequently backed by ABS and MBS, we decided to exclude CDOs from our asset securitization dataset.

[293] We consider the following countries as pertaining to Western Europe: Austria; Belgium; Cyprus; Denmark; Finland; France; Germany; Greece; Iceland; Ireland; Italy; Luxemburg; the Netherlands; Norway; Portugal; Spain; Sweden; Switzerland; and the United Kingdom.

[294] We verify with Thomson Reuters that our project finance sample (loans with a deal specific purpose code of "project finance") refers to loans made to a vehicle company and with Dealogic that our asset securitization sample (bonds with a deal type code of "asset-backed security" and "mortgage-backed security") refers to securities sold to investors by bankruptcy-remote special purpose vehicles (SPVs).

[295] We examine only PF loans that are actually signed loans.

and asset securitization transactions typically consist of several tranches funding the same SPV. Therefore, we focus on the transaction tranches as our basic observation. Our sample has two limitations for the purposes of our research. First, it may have some problems of colinearity, because multiple tranches appear as separate observations in our sample. Second, some issues have incomplete loan characteristics, which, as a result, will reduce our sample in the univariate analysis (section 4.4.) and in the multivariate regression analysis (Chapter 5).

4.4. Descriptive Statistics

This section provides a full-length statistical analysis of SF (project finance and asset securitization) *versus* SDF (corporate bonds) lending in Western Europe. We start by comparing the distribution of loans and bonds across time, industry, and nationality of the borrower/issuer. The financial characteristics of project finance (PF) loans are compared with the sample of asset securitization (AS) bonds, as well as with our corporate bonds (CB) sample. Univariate tests of significance differences between PF, AS, and CB tranches are also presented. Finally, non-parametric tests are used to compare whether the values reported for each variable are significantly different in pre-crisis and crisis periods.

4.4.1 Characteristics of Structured Finance *versus* Straight Debt Finance

The distribution by year of PF, AS, and CB issues in the full sample, is described in Table 4.1. Table 4.2 presents the industrial distribution of the PF, AS, and CB issues, while Table 4.3 presents the geographic distribution of the facilities in each of these three samples.

Year	Project Finance Loans			Asset Securitization Bonds			Corporate Bonds		
	Number of Tranches	Total Value of Tranches (Euro Millions)	Percent of Total Value	Number of Tranches	Total Value of Tranches (Euro Millions)	Percent of Total Value	Number of Tranches	Total Value of Tranches (Euro Millions)	Percent of Total Value
2000	84	13,502	4.1	115	26,027	14.5	1,250	341,913	5.9
2001	87	13,061	3.9	81	12,990	7.3	1,138	363,536	6.3
2002	69	13,455	4.1	77	17,709	9.9	1,187	278,418	4.8
2003	124	23,067	6.9	42	14,894	8.3	1,962	376,540	6.5
2004	119	12,292	3.7	66	31,555	17.6	2,477	393,164	6.8
2005	122	18,278	5.5	53	10,034	5.6	2,454	597,527	10.3
2006	131	18,340	5.5	55	10,639	5.9	2,628	691,627	12.0
2007	233	27,204	8.2	35	3,469	1.9	2,819	575,316	9.9
2008	638	60,423	18.2	39	36,122	20.2	1,125	444,552	7.7
2009	376	33,567	10.1	36	15,694	8.8	1,412	797,634	13.8
2010	496	53,187	16.0	-	-	-	1,337	506,067	8.7
2011	380	45,739	13.8	-	-	-	1,188	420,238	7.3
Total	2,859	332,114	100.0	599	179,132	100.0	20,977	5,786,532	100.0

Table 4.1: Distribution of the sample of PF, AS, and CB issues by year.[296]

Table 4.1 shows the evolution of PF, AS, and CB issues between 2000 and 2011. PF lending to Western Europe peaked in 2008 (by value and number), fell in 2009 and rose again in 2010. AS also peaked in 2008 and fell in 2009. After 2009, we do not have observations in our sample. This is partly explained by the European sovereign debt crisis, which has limited the increase of securitized products, but also by the fact that an increasing number of banks have underwritten their own securitization programs to use them as a guarantee for obtaining resources in the auctions of the European Central Bank (ECB), issuing the so-called Covered Bonds. As asserted by Cardone-Riportella et al. (2010), these practices "*... have partially replaced the issue of debt, or the interbank market itself, as sources of finance to enable banks to grant loans.*" Finally, CB issues peaked in 2009 and since then have fallen.

Table 4.2 reveals interesting differences between PF and AS, which largely confirm the standard picture of these two types of SF transactions. Table 4.2 shows that AS bonds are highly concentrated in one industry, whereas the general population of PF loans reveals a far less concentrated industrial pattern. 75.1% of all AS bonds (by value) are

[296] The first three columns describe characteristics of the sample of loans in the Dealscan database with the loan purpose code listing as "project finance". Column four to six describe characteristics for the sample of bonds in the DCM Analytics database with the deal type code of "asset-backed security" and "mortgage-backed security" (asset securitization bonds), while the next three columns provide similar information for the sample of bonds in the DCM Analytics database with the deal type code of "corporate bond-investment-grade" and "corporate bond-high yield" (corporate bonds). The first, fourth, and seventh columns detail the number of each type of debt tranche issued between 2000 and 2011, while the second, fifth, and eight columns describe the total value (in Euro millions). The third, sixth, and ninth columns present percentages of the total value for each year.

issued by sponsors in the financial industry, while only 1.4% of PF lending goes to borrowers in this industry. PF lending is concentrated in four key industries; i.e., industrial (37.9%), utilities (31.1%), transportation (13.7%), and commercial (10.6%) industries account for 93.3% of all PF lending (value) and 93.7% of all PF loans. Similar results are presented by Kleimeier and Megginson (2000). Based on a sample of 4.956 PF loans booked on national and international markets from January 1st, 1980 through to March 23rd, 1999, they find that no less than 90.9% of all PF lending (by value) are made to borrowers in the Commercial & Industrial, Utilities, and Transportation industries.[297] These industries account for only 24.9% of the total value – and 25.9% of the number – of AS bonds. This finding is consistent with the common wisdom that project finance is used primarily to fund tangible-asset-rich and capital intensive projects, while asset securitization is a form of financing where monetary assets with predictable cash flows are pooled and sold to a specially created third party that has borrowed money to finance the purchase. Conversely, a number of similarities can be established between the general population of AS and CB samples. As for AS, CB are highly concentrated in the financial institutions industry (67.2% of the total value and 80.8% of the total number). The most interesting difference can be observed in the industrial industry, which accounts for 13.2% of all corporate bond lending, almost double the fraction for AS (6.5%) – 8.6% of the total number *versus* 5.5% for AS.

Industrial Category of Borrower	Project Finance Loans			Asset Securitization Bonds			Corporate Bonds		
	Number of Tranches	Total Value of Tranches (Euro Millions)	Percent of Total Value	Number of Tranches	Total Value of Tranches (Euro Millions)	Percent of Total Value	Number of Tranches	Total Value of Tranches (Euro Millions)	Percent of Total Value
Commercial	454	35,259	10.6	90	21,750	12.1	1,226	677,251	11.7
Industrial	836	125,993	37.9	33	11,622	6.5	1,802	761,763	13.2
Utilities	1,206	103,214	31.1	27	8,522	4.8	692	355,409	6.1
Financial Institutions	12	4,777	1.4	444	134,457	75.1	16,952	3,887,415	67.2
Transportation	182	45,533	13.7	5	2,782	1.6	261	96,199	1.7
Government	112	8,518	2.6	-	-	-	7	794	0.0
Other	57	8,819	2.7	-	-	-	37	7,701	0.1
Total	2,859	332,114	100.0	599	179,132	100.0	20,977	5,786,532	100.0

Table 4.2: Industrial distribution of PF, AS, and CB issues.[298]

[297] Corielli et al. (2008) present similar results. Based on a sample of PF loans closed between January 1998 and May 2003 they show that the largest share of loans was awarded to electricity/power and other energy utilities (about 52% of the total value), followed by telecommunications (28%) and transportation (14%).

[298] The first, fourth, and seventh columns detail the number of tranches issued by borrowers/issuers in a particular industry, while the second, fifth, and eight columns describe the total value (in Euro millions)

Table 4.3 also shows clear differences between the Western European countries which attract PF lending and those where AS and CB are directed.

Geographic Location of Borrower	Project Finance Loans			Asset Securitization Bonds			Corporate Bonds		
	Number of Tranches	Total Value of Tranches (Euro Millions)	Percent of Total Value	Number of Tranches	Total Value of Tranches (Euro Millions)	Percent of Total Value	Number of Tranches	Total Value of Tranches (Euro Millions)	Percent of Total Value
Austria	12	2,788	0.8	1	27	0.0	1,442	135,740	2.3
Belgium	61	6,850	2.1	18	1,723	1.0	432	114,076	2.0
Cyprus	7	244	0.1	-	-	-	15	4,419	0.1
Denmark	11	1,307	0.4	-	-	-	24	5,000	0.1
Finland	10	4,780	1.4	-	-	-	115	35,219	0.6
France	229	27,340	8.2	32	1,526	0.9	1,843	855,408	14.8
Germany	160	19,424	5.8	117	47,299	26.4	7,604	1,387,083	24.0
Greece	62	10,874	3.3	2	74	0.0	160	66,692	1.2
Iceland	4	450	0.1	-	-	-	2	306	0.0
Ireland	74	4,613	1.4	10	3,309	1.8	186	99,279	1.7
Italy	348	28,296	8.5	52	39,314	21.9	1,755	611,264	10.6
Luxemburg	3	311	0.1	3	173	0.1	79	27,127	0.5
Netherlands	83	14,691	4.4	42	4,270	2.4	1,242	465,500	8.0
Norway	29	4,658	1.4	-	-	-	1	350	0.0
Portugal	198	20,993	6.3	11	1,391	0.8	420	85,015	1.5
Spain	915	93,152	28.0	19	6,228	3.5	1,097	572,038	9.9
Sweden	30	2,144	0.6	-	-	-	15	4,483	0.1
Switzerland	17	10,769	3.2	-	-	-	1,709	103,240	1.8
United Kingdom	606	78,429	23.6	292	73,797	41.2	2,836	1,214,293	21.0
Total	2,859	332,114	100.0	599	179,132	100.0	20,977	5,786,532	100.0

Table 4.3: Geographic distribution of PF, AS, and CB issues.[299]

AS bonds are highly concentrated in three countries (89.5% by value and 77% of the total number of issues are made by borrowers located in U.K., Germany, and Italy), with the bulk number of issues concentrated in the U.K. (41.2% by value and 48.7% of all AS tranches). The general population of PF loans reveals a far less concentrated geographic pattern. No less than six countries concentrate 80.6% of the total value – and no less than 85.9% of the total number – of PF loans. Closer analysis reveals a similar pattern for CB issues, with the same six countries (Germany, U.K., France, Italy, Spain, and Portugal) accounting for an identical fraction (81.7% of the total value of CB *versus* 80.6% of all PF lending). The biggest recipient of CB lending is Germany. This country accounts for 24% of the total value of CB issues (26.4% for AS bonds), whereas it

for each industry. The third, sixth, and ninth columns present percentages of the total value for each industry. We divided the industrial category of the borrower into seven categories as proposed by Kleimeier and Megginson (2000).

[299] The first, fourth, and seventh columns detail the number of each type of debt security issued in a particular country in Western Europe, while the second, fifth, and eight columns describe the total value (in Euro millions) for each country. The third, sixth, and ninth columns present percentages of the total value for each country.

accounts for a mere 5.8% of the value of all PF lending. Intriguingly, U.K. borrowers are less represented in the PF sub-sample than the Spanish borrowers (23.6% by value *versus* 28%). Considering the emphasis placed by U.K. governments on the Private Finance Initiative (PFI); i.e., on private rather than public financing of large public infrastructure projects, one would expect a grater fraction of U.K. borrowers in the total value of PF loans.

Table 4.4 presents basic characteristics for the full sample of PF, AS, and CB issues. Significant differences are revealed between both SF and SDF issues, as well as between the two categories of SF issues (i.e., PF and AS tranches). One of the most remarkable findings is how much larger AS and CB tranches are than PF tranches. These issues have mean values of 299 Euro millions (M€) and 276 M€, respectively, compared with 116 M€ for PF issues. The converse of this result is that PF tranches are, on average, 183 M€ smaller than the general population of AS tranches (116 M€ *versus* 299 M€) and 160 M€ smaller than of CB tranches (116 M€ *versus* 276 M€). Thus, as regards tranche size, AS securities are similar to SDF securities. This can be explained by the fact that both transactions involve the offer of securities in the capital markets, while syndicated loans are the prominent form of funding for project-financed investments.

According to the average maturity (years) variable, the three types of loans are substantially different financing instruments. The average maturity of PF loans, 13.6 years, is significantly lower that of the AS bonds full sample (20.9 years), but considerably longer than that of the CB full sample (5.3 years). Additionally, compared to AS and CB samples, PF loans involve more than the number of twice banks in the transaction. Further, AS and CB transactions are more likely to be exposed to currency risk when compared to the PF full sample.

Variable of interest	Project Finance Loans	Asset Securitization Bonds	Corporate Bonds
Number of tranches	2,859	599	20,977
Total volume, Euro millions	332,114	179,132	5,786,532
Tranche size, Euro millions			
Average	116	299	276
Minimum	0.045	0.050	0.017
Maximum	3,800	22,298	7,763
Average maturity, years	13.6	20.9	5.3
Tranches with guarantee (%)	96.9	100.0	2.1
Tranches with currency risk (%)	11.0	31.4	33.2
Tranches to U.K. borrowers (%)	21.2	48.7	13.5
Tranches to financial institutions (%)	0.428	74.1	80.8
Average number of banks	6.9	2.4	2.9

Table 4.4: Basic characteristics for the full sample of PF, AS, and CB issues.[300]

The most remarkable similarity between SF instruments is how frequently PF loans and AS bonds are issued with guarantees (96.9% and 100%, respectively). This largely meets the standard characteristics of project finance and asset securitization. Contrary to the traditional corporate bonds, where it is the ability of the issuer to generate sufficient cash flows to repay the debt obligation that determines the risks of the transaction, in asset securitization the source of repayments shift from the cash flows of the issuer to the cash flows generated by the securitized assets and/or a third party guarantor, in case of default. In a project finance transaction, the financing is structured with as little recourse as possible to the sponsor, while at the same time providing sufficient credit support through guarantees or undertakings of a sponsor or third party, so that lenders will be satisfied with the credit risk.

Perhaps the most significant difference between PF loans and the other two types of issues is how infrequently PF loans are extended to financial institutions. Whereas 74.1% of AS tranches and 80.8% of CB tranches are issued by borrowers in this industry, only 0.43% of all PF loans are issued by sponsors in the financial institutions industry.

4.4.2 Loans and Bonds Pricing Samples Description

Since we wish to determine whether SF instruments are more or less expensive for borrowers/sponsors than SDF securities, and to compare the common pricing characteristics associated with PF, AS and CB issues, we select from our full sample

[300] Table 4.4 details samples of loans and bonds requiring that the amount is available.

those issues that have comparable pricing data expressed.[301] This screen has yielded a "high-information" sub-sample of 12,080 loans (worth 4,962,996 M€), of which 1,090 (worth 158,487 M€) have been classified as PF loans, AS bonds represent 439 issues (worth 140,733 M€), and 10,551 are CB issues (4,663,777 M€). Our high-information samples include issues with five (A) default and recovery risk characteristics (credit rating, loan to value, time to maturity, tranches with guarantee, and country risk); nine (B) marketability characteristics (tranche size, number of tranches, number of bookrunners, number of banks, type of interest rate, tranches to U.K. borrowers, tranches to financial institutions, and finally management fee); and one (C) systematic risk characteristic (tranches with currency risk).[302]

On average, we document a relatively high survival rate from the full sample to the high-information sample (54.7% for PF loans, 75.2% for AS bonds, and 54.3% for CB). This is presented in Tables 4.5, 4.6, and 4.7. Each table represents the characteristics (or variables of interest) of the full sample compared with the high-information sample.

Variable of interest	PF Loans full sample			PF Loans high-information sample			Survival Rate
	Number	Mean	Std. Dev.	Number	Mean	Std. Dev.	
Credit spread (bps)	1,090	198.3	138.5	1,090	198.3	138.5	100.0%
Credit rating [1-22 weak]	80	7.0	3.9	46	6.3	4.3	58%
Loan to value (%)	2,859	47.3%	39.4%	1,090	47.9%	38.4%	38%
Time to maturity (years)	2,573	13.6	9.3	1,060	13.9	9.1	41%
Tranches with guarantee	2,270	96.9%	-	764	94.2%	-	34%
Tranche size, Euro millions	2,859	116.2	225.9	1,090	145.4	240.7	38%
Number of tranches	2,845	2.9	1.7	1,080	3.0	1.7	38%
Number of bookrunners	955	2.1	1.9	461	2.2	2.0	48%
Number of banks	2,829	6.9	6.7	1,078	8.9	7.6	38%
Tranches with fixed rate	1,110	1.4%	-	1,090	0.0%	-	98%
Tranches with floating rate	1,110	98.6%	-	1,090	100.0%	-	98%
Tranches with currency risk	2,859	11.0%	-	1,090	11.5%	-	38%
Country risk [1-22 weak]	2,859	2.1	1.7	1,090	2.0	1.6	38%
Tranches to U.K. borrowers	2,859	21.2%	-	1,090	19.4%	-	38%
Tranches to financial institutions	2,805	0.4%	-	1,078	0.5%	-	38%
Management fee (bps)	140	49.0	34.4	130	50.8	34.9	93%

Table 4.5: Common pricing characteristics of PF loans in the full sample compared with those in the high-information sample.

[301] We select from our full sample those credits that have complete data on credit spread.
[302] This segmentation of our high-information sample characteristics is based on Vink and Thibeault (2008) work for a sample of 3,467 loans (worth 163,900 M€).

Variable of interest	AS Bonds full sample			AS Bonds high-information sample			Survival Rate
	Number	Mean	Std. Dev.	Number	Mean	Std. Dev.	
Credit spread (bps)	439	148.9	167.4	439	148.9	167.4	100.0%
Credit rating [1-22 weak]	497	4.3	3.5	364	4.3	3.6	73%
Loan to value (%)	599	36.4%	35.6%	439	39.4%	36.5%	73%
Time to maturity (years)	599	20.9	14.8	439	21.3	15.3	73%
Tranches with guarantee	599	100.0%	-	439	100.0%	-	73%
Tranche size, Euro millions	599	299.1	1,070.4	439	320.6	1,189.6	73%
Number of tranches	599	4.5	2.7	439	4.2	2.6	73%
Number of bookrunners	599	1.4	0.7	439	1.4	0.8	73%
Number of banks	599	2.4	1.9	439	2.5	1.9	73%
Tranches with fixed rate	599	24.9%	-	439	27.1%	-	73%
Tranches with floating rate	599	75.1%	-	439	72.9%	-	73%
Tranches with currency risk	599	31.4%	-	439	31.7%	-	73%
Country risk [1-22 weak]	599	1.3	0.9	439	1.4	0.9	73%
Tranches to U.K. borrowers	599	48.7%	-	439	39.9%	-	73%
Tranches to financial institutions	599	74.1%	-	439	76.8%	-	73%
Management fee (bps)	48	33.1	26.9	37	35.8	28.4	77%

Table 4.6: Common pricing characteristics of AS bonds in the full sample compared with those in the high-information sample.

Variable of interest	CB full sample			CB high-information sample			Survival Rate
	Number	Mean	Std. Dev.	Number	Mean	Std. Dev.	
Credit spread (bps)	10,551	157.6	193.3	10,551	157.6	193.3	100.0%
Credit rating [1-22 weak]	16,080	4.9	2.7	8,693	5.5	3.0	54%
Loan to value (%)	20,977	61.8%	45.4%	10,551	87.4%	27.2%	50%
Time to maturity (years)	20,977	5.3	5.9	10,551	6.9	5.9	50%
Tranches with guarantee	20,977	2.1%	-	10,551	3.7%	-	50%
Tranche size, Euro millions	20,977	275.9	439.5	10,551	442.0	517.0	50%
Number of tranches	20,575	18.4	29.8	10,545	1.8	3.3	51%
Number of bookrunners	20,973	1.6	1.2	10,549	2.1	1.5	50%
Number of banks	20,973	2.9	3.4	10,549	3.7	3.5	50%
Tranches with fixed rate	20,977	79.0%	-	10,551	67.9%	-	50%
Tranches with floaing rate	20,977	21.0%	-	10,551	32.1%	-	50%
Tranches with currency risk	20,977	33.2%	-	10,551	22.6%	-	50%
Country risk [1-22 weak]	20,977	1.4	1.2	10,551	1.8	1.5	50%
Tranches to U.K. borrowers	20,977	13.5%	-	10,551	16.9%	-	50%
Tranches to financial institutions	20,977	80.8%	-	10,551	67.3%	-	50%
Management fee (bps)	2,235	22.7	18.9	1,334	21.4	19.2	60%

Table 4.7: Common pricing characteristics of CB in the full sample compared with those in the high-information sample.

A comparison of the common variables in the full samples and the high-information samples in Tables 4.5, 4.6, and 4.7 reveals that the high-information issues are not dissimilar to their counterparties in terms of credit spread (remain the same), default and recovery risk characteristics, marketability characteristics, and systematic risk characteristic. Therefore, we will assume that any empirical results derived from the high-information sub-samples can be extended to the larger population of all issues. In addition to the variables presented in Table 4.4, Tables 4.5, 4.6, and 4.7 present several new variables of interest. Although most of these are self-explanatory, next we present a discussion of each variable.

Credit Spread

The credit spread corresponds to the price for the risk associated with the financing instrument, on the basis of available information, at the time of the issue. For PF loans, the credit spread represents the spread paid by the borrower over 3-month Euribor (the three-month Euro Interbank Offered Rate) or 3-month Libor (the three-month London inter-bank offered rate).[303] For bonds, the spread is defined as the margin yielded by the security at issue above a corresponding currency treasury benchmark with a comparable maturity. The credit spread is presented in basis points.

Both measures are not perfect proxies for the credit risk associated with loans and bonds. In particular, the spread over Euribor or Libor does not represent the full economic cost of credit. Loans also carry fees that can be related to creditworthiness and performance. As pointed out by Sorge and Gadanecz (2008), "*...additional pricing factors, such as commitment fees, underwriting fees, participation fees, and utilization fees are typically charged during loan syndications and indeed during the whole lifetime of the loan.*"[304] Additionally, the bond issue also carries fees, namely up-front fees.

Considering the scarcity of secondary market prices and the absence of ratings data on the borrowers, the spread over Euribor or Libor for loans and the margin yielded by the security at issue above a comparable risk-free government security for bonds, have become standard pricing measures in the literature.[305] Even for AS bonds, we exclude

[303] All of our 1,090 available observations on PF loans credit spread are floating rate issues.

[304] Previous studies of PF loans have used either the initial spread (the spread at issue), the all-in spread (initial spread over Libor plus annual fees) or the average *ex ante* spread (this considers the different spreads over Libor, if they change, during the economic life of the loan). Due to the scarcity of information on the spreads applicable during the life of each loan as well as on the annual fees, we use the spread at issue.

[305] One has to remember that the probability of default of a project finance loan is only indirectly related to the creditworthiness of the project sponsors. In project finance, debt repayment comes from the project company only rather than from any other entity. Similarly, in an asset securitization issue the repayment depends only or primarily on the assets and cash flows pledged as collateral to the issue, and not on the overall financial strengths of the originator. On the other hand, in conventional corporate financing, lenders rely on the overall creditworthiness of the enterprise financing a new project to provide them security.

secondary market spreads, because of the relatively poor liquidity of the secondary market for these issues. The comparability of our pricing variables across loans and bonds can be improved by making the following adjustment:[306] while in PF loans the benchmark priced off Euribor or Libor is a three-month interbank rate, bonds typically carry a spread over a benchmark government security (e.g., German Treasury Bonds). Therefore, there is a difference between the two benchmarks represented by different credit risk levels involving unsecured short-term bank risk and a risk-free government rate. Following the approach of Thomas and Wang (2004) and Sorge and Gadanecz (2008), we adjust for the risk difference of the bond and loan benchmarks by adding to the Euribor or Libor spread of the PF loans the difference between the three-month Euro Libor and the three-month German Treasury bill at the time when the loans were granted.[307] [308]

Default and recovery risk variables

The first set of pricing variables represents default and recovery risk characteristics. A discussion of *credit rating*, *loan to value*, *time to maturity*, *guarantee*, and *country risk* variables will follow below.

Credit rating evaluates the credit worthiness of a debtor. It is an evaluation of the capacity of the borrower to repay interest and principal on time as promised. By including credit rating in our analysis, we can study the impact of default on PF, AS and CB issues. Since we need a consistent rating classification scheme, we use the rating scales as shown in Table 4.8. This classification scheme consists of 22 rating scales for two rating agencies: Standard & Poor's (S&P) and Moody's Investors Service. Loan

[306] Despite the adjustment, we are aware that the comparability between loans and bonds has some drawbacks, including that most bonds are fixed rate while loans are priced over a floating rate, and that bonds and loans may have quite different covenants. In Chapter 5, we include dummies in our baseline regressions that attempt to control for these differences.

[307] The average difference is 31 basis points and has a standard deviation of 44 basis points during our sample period; i.e., between January 1st, 2000 and December 31st, 2011. DealScan includes four fields that can be used to measure a borrowers' credit rating. Moody's and S&P ratings for the vehicle (group) company, plus the separate Moody's and S&P ratings for the company's senior debt. In order to maintain as large a sample as possible, we include all loans that contain at least one rating from any of these four possible rating fields.

[308] Additionally, as loans are priced over a three month rate while bonds tend to be priced off longer-term benchmarks, we will include as additional control in our regression analysis (Chapter 5) the slope of the Euro swap curve as the difference between the 5 year Euro swap rate and the 3-month Libor at the time of the signing of the loan or issuing the bonds.

and bond ratings are based on the S&P and Moody's bank loan rating at close. If missing, S&P and Moody's senior debt rating at close are used. If both ratings are available, the average rating is calculated and used.[309]

Rating agency		Value
Standard & Poor's	Moody's	
AAA	Aaa	1
AA+	Aa1	2
AA	Aa2	3
AA-	Aa3	4
A+	A1	5
A	A2	6
A-	A3	7
BBB+	Baa1	8
BBB	Baa2	9
BBB-	Baa3	10
BB+	Ba1	11
BB	Ba2	12
BB-	Ba3	13
B+	B1	14
B	B2	15
B-	B3	16
CCC+	Caa1	17
CCC	Caa2	18
CCC-	Caa3	19
CC	Ca	20
SD	C	21
D	-	22

Table 4.8: Credit rating scales.

Loan to value ratio represents the ratio of the tranche size to the transaction size of a given loan or bond.[310] This variable is included in our analysis because we intend to control for credit protection of all positions taken by lenders. To compute loan to value ratios, we manually calculated the weight of each loan or bond tranche in each transaction that contains more than one tranche. If the transaction contains one tranche only, the loan to value ratio is 100%. This variable should have an important role in SF instruments. For example, in an AS transaction, each senior class (or tranche) has absolute priority in the cash flow over the more junior classes (the so-called subordination credit enhancement mechanism). As junior tranches are typically smaller than the senior ones, we find lower loan to value ratios for these tranches.

[309] This classification scheme follows the approach proposed by Gatti et al. (2007) and Sorge and Gadanecz (2008).
[310] In constructing this variable we follow the methodology proposed by Vink and Thibeault (2008).

Time to maturity represents the lifetime of the loan or the bond, expressed in years. We calculated the time to maturity as the difference between the contractual maturity date of the issue and the active date or launch date.[311]

In our sample, tranches with *guarantee* refer to tranches with a third-party guarantee. Dummy variable takes the value of 1 if a loan is guarantee and 0 otherwise.

Country risk is approximated by Standard & Poor's country rating; i.e., the S&P's country credit rating at close. The rating is converted as presented in Table 4.8. Thus, this variable measures from 1 for the countries with the lowest risk to 22 for the countries of highest risk. Other measures of country risk are available and have been used in other studies – such as the monthly data compiled by the International Country Risk Guide (ICRG) or the country risk rank provided semi-annually by Euromoney magazine. The use of S&P's country rating is justified by its strong correlation with these alternative measures.[312]

Marketability variables

The second set of variables represents the marketability of the loan. A discussion of *tranche size*, *number of tranches*, *number of bookrunners*, *number of banks*, *floating rate issue*, *fixed rate* issue, *U.K. borrowers*, *financial institutions*, and finally *management fee* variables will follow below.

The *tranche size* is the face value of the loan or bond tranche in Euro millions. Each transaction is divided into one or more tranches. For every issue in a given transaction, we documented the *number of tranches* for each transaction.

The *number of bookrunners* represents the number of financial institutions participating in the loan issuance as bookrunners.[313] A broader variable is the *number of banks* which represents the number of financial institutions participating in the loan issuance. All

[311] Legal maturity is the date before which a specified tranche of securities must be repaid in order not be in default.

[312] Erb, Harvey, and Viskanta (1996) find that S&P's and Moody's ratings have a 90% rank-order correlation with the IRCG financial rating. Corielli et al. (2008) present a high correlation (0.902) between S&P ratings and Euromoney country risk scores.

[313] In a large transaction that involves multiple companies, the bookrunner takes the responsibility of 'running' or handling the books, and is listed first among the other underwriters participating in the issuance. More than one bookrunner can manage a security issuance, in which case the involved parties are called 'joint bookrunners'.

roles are included here. We collected this information in order to analyze any differences in syndicate; i.e., in order to assess the extent to which risk is being shared among many institutions, as opposed to the case where the syndicate is small.

We include type of interest rate to analyze the impact of fixed and floating interest rates on the spread. We construct two dummy variables based on the type of interest rate. *Floating rate issue* is a dummy variable taking the value of 1 if a loan is floating price and zero otherwise. *Fixed rate issue* is also a dummy variable taking the value of 1 if a loan is fixed price and zero otherwise.

U.K. borrowers is a dummy variable taking the value of 1 if the borrower/issuer-country belongs to U.K. and 0 otherwise. We include *financial institutions* variable to analyze the impact of a borrower/issuer belonging or not to the financial industry on the credit spread. We construct a dummy variable taking the value of 1 if the loan goes to borrowers/issuers in financial industry and zero otherwise.

Finally, *management fee* represents a periodic payment that is made to the syndicate of banks for managing the transaction. In the syndication market, management fees are also called commitment fees. The management fee is presented in basis points.

<u>Systematic risk variable</u>

For PF transactions, *currency risk* occurs when loan tranches (and its currency of payments) are denominated in a currency different from the currency in the borrower's home country.[314] For corporate bonds or securitization transactions, currency risk occurs when they are denominated in a foreign currency. Thus, a dummy variable is constructed which takes the value one if this is the case and currency risk exists.

In summary, with the exception of variables *guarantee*, *floating rate issue*, *fixed rate* issue, *currency risk*, *U.K. borrowers*, and *financial institutions*, all of which are discrete, all other variables are continuous. The univariate analysis is presented in the next section.

[314] For example, a German borrower arranging a dollar loan would be subject to currency risk, whereas that same borrower arranging a euro-denominated loan would not be.

4.4.3 Univariate Analysis

This section examines how credit spread and common pricing factors compare for the three types of financing instruments. The purpose is to provide insight into the common pricing characteristics associated with SF and SDF instruments. In short, the first two hypotheses (Hypothesis 1 and Hypothesis 2) are tested with respect to SF and SDF pricing. We hypothesize that not only the credit spread but also the common pricing factors differ significantly in value between SF and SDF issues. We use a parametric test (*Student's t-test*) for continuous variables and a non-parametric test (*Fisher's exact test*) for dummy variables, to compare whether the values reported for each variable are significantly different not only between SF and SDF transactions, but also between PF and AS issues. The purpose is to find out whether the common pricing factors do in fact significantly differ in value between them.

Table 4.10 provides *t-tests* and *Fisher's exact tests* comparing the values of each variable in AS bonds full sample with the corresponding values in the PF loan full sample; the values of each variable in AS bonds full sample with the corresponding values in the CB full sample; and the values of each variable in PF loan full sample with the corresponding values in the CB full sample. The numbers are t-statistics for continuous variables and p-values for dummy variables (this is because the Fisher's exact test does not have a "test statistic", but outputs the p-value directly) and almost all of the pair-wise comparisons indicate statistically significant differences between the common pricing variables associated with PF, AS, and CB issues. We will discuss below the main finding included in Table 4.9 – which presents univariate analysis for continuous and dummy variables – and in Table 4.10.

Variable of interest	Type of loan issue			Variable of interest	Type of loan issue		
	PF	AS	CB		PF	AS	CB
Univariate analysis - continuous variables							
Credit spread (bps)				**Number of tranches**			
Number	1,090	439	10,551	Number	2,845	599	20,575
Mean	198.3	148.9	157.6	Mean	2.9	4.5	18.4
Min.	9.2	-220.4	-213.8	Min.	1	1	1
Max.	2,042.7	1,098.9	1,651.5	Max.	10	12	99
Std. Dev.	138.5	167.4	193.3	Std. Dev.	1.7	2.7	29.8
Credit rating [1-22 weak]				**Number of bookrunners**			
Number	80	497	16,080	Number	955	599	20,973
Mean	7	4.3	4.9	Mean	2.1	1.4	1.6
Min.	1	1	1	Min.	1	1	0
Max.	16	17	21	Max.	15	5	21
Std. Dev.	3.9	3.5	2.7	Std. Dev.	1.9	0.7	1.2
Loan to value (%)				**Number of banks**			
Number	2,859	599	20,977	Number	2,829	599	20,973
Mean	47.3%	36.4%	61.8%	Mean	6.9	2.4	2.9
Min.	0.07%	0.01%	0.05%	Min.	1	1	1
Max.	100.0%	100.0%	100.0%	Max.	51	14	50
Std. Dev.	39.4%	35.6%	45.4%	Std. Dev.	6.7	1.9	3.4
Time to maturity (years)				**Country risk [1-22 weak]**			
Number	2,573	599	20,977	Number	2,859	599	20,977
Mean	13.6	20.9	5.3	Mean	2.1	1.3	1.4
Min.	0.03	0.22	0.21	Min.	1	1	1
Max.	42.9	85.9	100.1	Max.	11	6	20
Std. Dev.	9.3	14.8	5.9	Std. Dev.	1.7	0.9	1.2
Tranche size (Euro millions)				**Management fee (bps)**			
Number	2,859	599	20,977	Number	140	48	2,235
Mean	116.2	299.1	275.9	Mean	49.0	33.1	22.7
Min.	0.05	0.05	0.02	Min.	0.8	2.0	0.0
Max.	3,800	22,298	7,763.2	Max.	200.0	100.0	200.0
Std. Dev.	225.9	1,070.4	439.5	Std. Dev.	34.4	26.9	18.9
Univariate analysis - dummy variables							
Guarantee				**Currency risk**			
N. of issues with data available	2,270	599	20,977	N. of issues with data available	2,859	599	20,977
N. of issues with dummy = 1	2,200	599	449	N. of issues with dummy = 1	315	188	6,967
% of total available data	96.9%	100.0%	2.1%	% of total available data	11.0%	31.4%	33.2%
Floating rate issue				**U.K. borrowers**			
N. of issues with data available	1,110	599	20,977	N. of issues with data available	2,859	599	20,977
N. of issues with dummy = 1	1,094	450	4,400	N. of issues with dummy = 1	2,253	292	2,836
% of total available data	98.6%	75.1%	21.0%	% of total available data	21.2%	48.7%	13.5%
Fixed rate issue				**Financial institutions**			
N. of issues with data available	1,110	599	20,977	N. of issues with data available	2,805	599	20,977
N. of issues with dummy = 1	16	149	16,577	N. of issues with dummy = 1	12	444	16,952
% of total available data	1.4%	24.9%	79.0%	% of total available data	0.4%	74.1%	80.8%

Table 4.9: Univariate statistics - pricing features associated with Loans and Bonds compared.[315]

The relative pricing of SF (PF and AS issues) *versus* SDF (CB issues) issues is one of the most important findings detailed in Tables 4.9 and 4.10. Average credit spreads are statistically and significantly higher for PF loans (198.3 bps) than they are for AS bonds (148.9 bps) and CB (157.6 bps).[316] On the contrary, average credit spreads for AS and

[315] Table 4.9 provides a univariate analysis for the full sample of PF, AS, and CB issues.
[316] This is in line with the prediction of Fabozzi et al. (2006), who present higher costs of borrowing when compared to conventional financing as one of the major disadvantages of project finance.

CB issues do not differ significantly at 5% significance level.[317] Therefore, we accept only the hypothesis that the credit spread on SF is lower than or equal to the credit spread on SDF for AS issues (Hypothesis 2). Our findings diverge from those presented by Hu and Cantor (2006) and Maris and Segal (2002), which state that securitization securities credit spreads have been higher than corporate bond credit spreads.[318] If we compare the average spread exhibited in Table 4.9 with the average spread exhibited by PF loans and all syndicated loans in the study of Kleimeier and Megginson (2000), we notice that PF loans in Western Europe have higher average spread (198.3 bps *versus* 130 bps) and that PF, AS, and CB issues have higher average spread in comparison with the spread for all syndicated loans (134 bps).[319]

Variable of interest	Type of loan issue		
	AS versus PF	AS versus CB	CB versus PF
Continuous variables: two-sample *t*-tests assuming unequal variances			
Credit spread (bps)	-5.47	-1.06 #	-8.85
Credit rating [1-22 weak]	-5.70	-3.77	-4.68
Loan to value (%)	-6.67	-17.11	18.19
Time to maturity (years)	11.75	25.84	-43.92
Tranche size (Euro millions)	4.16	0.53 #	30.70
Number of tranches	12.94	-59.35	73.65
Number of bookrunners	-9.44	-6.43	-7.18
Number of banks	-30.14	-6.22	-30.78
Country risk [1-22 weak]	-16.70	-2.72	-21.66
Management fee (bp)	-3.28	2.68	-8.99
Dummy variables: Fisher's exact test (p-values)			
Guarantee (0/1)	0.000	0.000	0.000
Fixed rate issue (0/1)	0.000	0.000	0.000
Currency risk (0/1)	0.000	0.356 *	0.000
U.K. borrowers (0/1)	0.000	0.000	0.000
Financial institutions (0/1)	0.000	0.000	0.000

Table 4.10: Tests of significance for the difference in values among PF, AS and CB issues.[320]

[317] These results were primarily confirmed by the ANOVA *F* test. We reject the hypothesis of equal means (p=0.0000). Our overall conclusion that these three types of issues are not the same arise mainly from the contrast between PF loans and the other two types of bond issues (AS and CB tranches).

[318] Hu and Cantor (2006), based on a sample of 16,516 securitization securities (ABS, MBS, and CDOs), issued in the U.S. market between 1998 and 2004, analyze the relationship between securitization issuance spreads, credit ratings, and credit performance. Maris and Segal (2002) argue that the lack of familiarity might have caused investors to overestimate the risks, and could explain why yield spreads were high in the early 1990s for CMBS.

[319] Kleimeier and Megginson (2000) compare the characteristics of a sample of 4,956 project finance loans (worth $634 billion) to comparable samples of non-project finance loans, all of which are drawn from a comprehensive sample of 90,784 syndicated loans (worth $13.2 trillion). All syndicated loans include project finance loans, corporate control loans, capital structure loans, fixed asset-based loans, and general corporate purpose loans.

[320] For continuous variables, # indicates that the values do not differ significantly between the two loan issues at the 5% significance level. All other values are statistically and significantly different at the 5% level or higher. For dummy variables, * indicates that the proportion of tranches for which dummy = 1

Even if we compare the average credit spread for PF loans exhibited in our study without the adjustment for the risk difference of the bond and loan benchmarks (31 bps during our sample period) we continue to notice that PF loans in Western Europe have a higher average spread (167.3 bps *versus* 130 bps).[321] However, based on recent samples Gatti et al. (2007) and Corielli et al. (2008) find a similar average spread for PF loans (169.18 bps and 171.8 bps, respectively).[322] Vink and Thibeault (2008) present lower average spread for ABS (99.2 bps) and MBS (73.9 bps) in comparison with the average credit spread for AS bonds (148.9 bps) exhibited in our study.[323]

AS and CB issues, on average, tend to be less risky than their PF counterparts. The average credit rating for AS (4.3) and CB (4.9) issues is significantly lower than the credit rating for PF loans (7).[324] When comparing SF with SDF tranches, we conclude that the average credit rating for AS bonds is significantly lower than the average credit rating for CB issues. Table 4.11 provides the breakdown by credit rating of tranche size and credit spread specific variables. Average credit spread increase with rating levels; i.e., credit spreads increase as ratings worsen.[325] Additionally, the observed level of management fees and the number of participating banks do provide indirect evidence that PF lending may be considered relatively more risky than other types of lending. The average level of management fees for PF loans (49 bps) is significantly higher than the level for AS (33.1 bps) and CB (22.7 bps) issues. The average number of banks participating in PF loans is 6.9 and is significantly larger than the average of 2.4 for AS

does not differ significantly between the issue class. Note that the Fisher's exact test does not have a "test statistic", but outputs the p-value directly.

[321] The same conclusion is reached if we compare our results with those of Esty and Megginson (2003) and Blanc-Brude and Strange (2007). They present a mean spread of 122.8 bps (based on a sample of 495 PF tranches for projects in 61 different countries) and 109.52 bps (for a sample of 177 UK PFI PPPs), respectively.

[322] Using a sample of 4,122 PF loans (worth $585 billion), Gatti, Kleimeier, Megginson, and Steffanoni (2007) show, that certification by lead arrangers creates economic value by reducing overall loan spreads. Corielli et al. (2008) use a sample of 1,093 PF loans closed between January 1998 and May 2003.

[323] Vink and Thibeault (2008) compare the characteristics of a sample of 2,427 ABS issues (worth €363.19 billion), 3,650 MBS issues (worth €715.21 billion) and 2,504 CDO issues (worth €316.72 billion). They compare the common pricing characteristics associated with the main security class and investigate to what extent ABS, MBS, and CDO issues are priced by common factors.

[324] Gatti et al. (2007) find an average credit rating for PF loans significantly lower than the average credit rating for PF loans presented in Table 4.9: BB *versus* A- in our study.

[325] Similar findings are presented by Hu and Cantor (2006), which assert that asset securitization ratings are highly correlated with credit spreads.

bonds and 2.9 for CB.[326] These findings suggest that banks wish to increase the number of institutions participating in a PF credit of a given size in order to spread risks over a large number of banks. AS bonds have the lowest average number of bookrunners (1.4), which differ significantly (at 5% significance level) from the average number of bookrunners in CB (1.6) and PF (2.1) issues.

Credit Rating (S&P's / Moody's)	Project Finance Loans		Asset Securitization Bonds		Corporate Bonds	
	Average Tranche Size (Euro millions)	Average Credit Spread (bps)	Average Tranche Size (Euro millions)	Average Credit Spread (bps)	Average Tranche Size (Euro millions)	Average Credit Spread (bps)
AAA / Aaa	242.8	121.7	466.7	63.6	336.5	73.2
AA+ / Aa1			107.8	82.3	436.9	103.7
AA / Aa2	70.0	124.4	860.6	103.7	263.3	95.6
AA- / Aa3	107.3	80.0	75.2	111.8	394.5	117.3
A+ / A1	37.2		31.2	121.9	300.5	93.3
A / A2	89.7	77.4	120.3	157.0	275.9	112.6
A- / A3	339.6	174.5	164.4	109.3	406.6	122.5
BBB+ / Baa1	264.8	154.9	116.2	217.0	514.0	164.9
BBB / Baa2	320.9	150.4	65.0	212.1	456.3	203.1
BBB- / Baa3	248.0	150.5	50.8	304.6	417.3	250.5
BB+ / Ba1			36.0	597.3	522.2	383.7
BB / Ba2			44.5	413.0	463.1	414.9
BB- / Ba3	199.8	232.1	67.4	579.8	319.8	440.2
B+ / B1	827.3				404.2	573.8
B / B2	700.0		21.7	572.9	301.5	604.3
B- / B3	700.0	205.9			250.2	637.0
CCC+ / Caa1			607.5	215.6	313.9	709.3
CCC / Caa2					140.0	740.1
CCC- / Caa3					203.6	810.9
CC / Ca					64.2	811.3
SD / C					153.7	638.2
N/A	112.4	200.8	172.2	200.7	78.0	246.2
Total	116.2	198.3	299.1	148.9	275.9	157.6

Table 4.11: Breakdown by credit rating of tranche size and credit spread specific variables.

PF lending exhibits the lowest average tranche size of 116.2 M€ – an average 182.9 M€ less than the average tranche size exhibited by AS bonds and 159.7 M€ less than the average tranche size exhibited by CB. Although PF loans are significantly different from AS and CB issues, the average tranche size exhibited by AS bonds do not differ significantly at 5% significance level from the average tranche size exhibited by CB. Conversely to what can be observed for PF and CB issues, in AS bonds the average tranche size decreases significantly as the credit rating worsens (with the exception of CCC+ / Caa1 rating class). This finding is presented in Table 4.11 and clearly reflects

[326] However, Esty and Megginson (2003) document a significantly larger average number of banks participating in PF loans. The average number of banks increases from 14.4 in the average tranche to 28 banks in the largest tranches.

the approach commonly used by originators in securitization deals. In these transactions, in fact, an issue is structured in order to obtain a given credit rating. Lead managers concentrate their efforts on making the AAA tranche as large as possible in order to reduce costs and improve transaction attractiveness for investors. If we compare the average tranche size exhibited in Table 4.11 for AS bonds with the average loan tranche presented by Vink and Thibeault (2008), we notice that it is relatively large when compared to 150.3 M€ and 209.6 M€ for ABS and MBS, respectively. The same pattern in observed when we compare AS and CB issues average tranche size in our study to the average tranche size of all syndicated loans. Kleimeier and Megginson (2000) report that all syndicated credits have an average tranche size of $203 million. Furthermore, we found that CB issues have the highest average loan to value level with 61.8%, followed by PF loans with 47.3%, and AS bonds with 36.4%.

Currency risk clearly suggests that AS bond issues are often similar to CB issues, but otherwise fundamentally different financial instruments from PF loans. PF loans in Western Europe are much less likely to be subject to currency risk than AS and CB issues are (11% for PF loans *versus* 31.4% and 33.2% for AS and CB issues, respectively).[327] PF loan borrowers are, on average, located in far riskier countries than in the case of any other issue category. The average country rating for PF borrowers (2.1) is significantly higher than the corresponding value for AS bonds (1.3) and CB (1.4).[328] Despite a similar average country rating presented for AS bonds and CB they are statistically and significantly different at the 5% level or higher.

Most of the non-price variables detailed in Table 4.9 clearly suggest that PF, AS, and CB issues are fundamentally different financial instruments. A far lower fraction of CB issues are arranged for U.K. borrowers (13.5%) than is true for PF loans (21.2%) and AS bonds (48.7%). As before, CB issues are much more likely to go to borrowers/issuers in financial industry (80.8%) than SF transactions (0.4% for PF loans and 74.1% for AS bonds). Additionally, a significantly larger number of tranches per transaction are issued in a CB transaction. In a typical CB transaction, the average

[327] If we compare the percentage of PF loan tranches subject to currency risk exhibited in Table 4.9 – 11% – with the percentage exhibited in Gatti et al. (2007) – 47% – , we notice that PF loans in Western Europe are much less likely to be subject to currency risk.

[328] Similar findings are presented by Kleimeier and Megginson (2000) when comparing the average country risk rank for PF borrowers with the corresponding value for FAB loans and for all syndicated loans.

number of tranches per transaction is 18.4, which is larger than the average number of 2.9 for PF loans and 4.5 for AS bonds. However, this number requires further analysis. The average number of tranches in the CB high-information sample (Table 4.7) falls significantly to 1.8, while it remains similar for PF (3) and AS (4.2) issues.[329] The average number of tranches presented for AS bonds in our study is on average similar to the one presented by Vink and Thibeault (2008) for ABS (3.2) and MBS (5.8).

An AS tranche of average size matures over just 20.9 years, which is a long period if we compare this with the average 13.6 and 5.3 years for PF and CB tranches, respectively.[330] Still, AS issues, as indicated by the standard deviation, exhibit significant heterogeneity with respect to maturity. For example, average standard deviation for maturity of AS issues is 14.8 years, while it is 9.3 and 5.9 years for PF and CB issues, respectively. The difference can be explained by the fact that certain types of assets underlying an AS structure have long maturities (e.g., residential mortgage loans). In general, the cash flow profile of the underlying assets is closely related to the maturity of the SF issues.

Finally, a significantly larger fraction of CB issues are fixed price (79%) than the full sample of PF loans (1.4%) and the full sample of AS bonds (24.9%). Locking in a specific rate in general, eliminates a major source of cash flows uncertainty. Nevertheless, floating rate issues tend to offer more flexibility due to the prepayment option in most loans.

Before proceeding to the next section, we will briefly summarize the results of our univariate comparison between SF and SDF issues. We found that most of the common pricing characteristics in fact differ significantly, not only between SF and SDF issues but also among SF transactions. Table 4.10 shows that all pair-wise comparisons indicate statistically significant differences in value, with the exception of credit spread, tranche size, and currency risk between AS and CB issues. Therefore, we reject the

[329] Thus, considering the average number of tranches in high-information samples we can conclude that in a typical AS transaction the average number of tranches per transaction is 4.2 (Table 4.6), which is higher than the average number of 3 for PF loans (Table 4.5). Closer analysis reveals that the assets underlying an asset securitization transaction may benefit from tranching to a larger degree [see Riddiough (1997) and DeMarzo (2005)].

[330] The mean loan maturity of PF loans is 8.6 and 8.7 years in Kleimeier and Megginson (2000) and Gatti et al. (2007), respectively. A higher average maturity of 10.5 years is presented by Corielli et al. (2008).

hypothesis (Hypothesis 1) that pricing factors of SF credit spreads do not differ significantly in relevance from the pricing factors of SDF credit spreads. Additionally, we also found that the common pricing characteristics among SF tranches (PF loans and AS bonds) do differ significantly. Considering the financial instruments as a whole, we have documented that the warranties and transaction structures differ between the three types of loan issues, but that there are also important univariate differences to consider, namely:

1. PF loans' average credit spreads are statistically and significantly higher than they are for AS and CB issues. On the contrary, average credit spreads for AS and CB issues do not differ significantly at 5% significance level. Thus, we reject the hypothesis (Hypothesis 2) that credit spread on SF is lower than or equal to the credit spread on SDF. This hypothesis would be accepted only if our SF full sample was merely composed of AS bonds.
2. Both AS and CB issues have a significant higher tranche size in comparison with PF loans.
3. AS bonds have much longer average maturity and are more likely to be arranged for U.K. borrowers (instead of borrowers belonging to continental Europe) than PF and CB issues.
4. PF lending may be considered relatively more risky because either the average level of management fee or the average number of banks participating are significantly larger than the average for AS and CB issues.
5. PF loans in Western Europe are much less likely to be subject to currency risk and borrowers are, on average, located in far riskier countries than in the case of any other issue category.
6. CB issues are more likely to be fixed rate rather than floating rate credits as are AS and PF tranches.

We will examine loan pricing more fully in Chapter 5, when we employ OLS regression to determine what factors influence SF and SDF instruments' credit spreads. However, our results indicate that the common pricing characteristics differ significantly in value between the three types of loan issues, and therefore we would expect the impact on pricing to be loan-specific. Before proceeding to a multivariate regression analysis, sub-section 4.4.4 presents an analysis of the impact of the 2007/2008 financial crisis, and the subsequent European sovereign debt crisis, on loans and bonds pricing factors. We investigate whether our results hold before (pre-crisis period) and during the global financial crisis (crisis period).

4.4.4 The Impact of the Financial Crisis on Credit Spreads and Pricing Factors

Until 2008 loans and bonds issues had been progressively growing (both in number of tranches and in volume), yet the 2007/2008 global financial crisis and the subsequent European sovereign debt crisis led to a drop in sponsor/issuer interest (see Table 4.1). Similar to sponsors/issuers, lenders might have also changed their attitude towards SF and SDF, in terms of pricing and compensation. We are therefore investigating whether our univariate results are robust over time considering a pre-crisis period from January 1st, 2000 and September 14th, 2008, and a crisis period from September 15th, through December 31st, 2011.[331]

We hypothesize (Hypothesis 4) that after controlling for macroeconomic conditions and loan characteristics, the financial crisis does not impact significantly on SF credit spreads. Thus, it is important to understand if the 2007/2008 financial crisis and the subsequent European sovereign debt crisis impact significantly not only on credit spread but also on the common pricing factors of loans and bonds tranches. We use a non-parametric test (Wilcoxon *z*-test for continuous variables and Fisher's exact test for dummy variables) to compare whether the values reported for each variable are significantly different in the two periods. Table 4.12 provides *z-tests* comparing the values for two sub-samples: pre-crisis period sub-sample and crisis period sub-sample. The numbers are z-statistics and almost all of the pair-wise comparisons indicate that equality of means of continuous variables can be rejected for PF, AS, and CB issues. The only exceptions are the average credit rating for PF loans and AS bonds, the average loan to value for AS bonds, and the average management fee for CB.

[331] September 15th, 2008 is the Lehman Brothers' bankruptcy filing date, commonly regarded as the major milestone of the 2007/2008 global financial crisis. Despite the problems experienced by Bear Stearns (in March 2008, it was forced to sell itself to J.P. Morgan) and by Fannie Mae and Freddie Mac (they had to be propped up by the U.S. Treasury and the Federal Reserve in July), the worst was yet to come. On Monday September 15th, 2008, after suffering huge losses in the subprime market, Lehman Brothers, the fourth-largest investment bank by asset size, filed for bankruptcy, making it the largest bankruptcy filing in U.S. history.

Similar findings are presented in Table 4.13 for dummy variables, which strongly support that, the proportion of tranches for which dummy = 1 differ significantly between the sub-samples pre-crisis period and crisis period. The exceptions are the guarantee for PF loans, fixed rate issue for PF loans and AS bonds, and financial institutions for PF loans.

Variable of interest	Type of loan issue											
	Project Finance				Asset Securitization				Corporate Bonds			
	Number	Mean	Std. Dev.	Wilcoxon z-test	Number	Mean	Std. Dev.	Wilcoxon z-test	Number	Mean	Std. Dev.	Wilcoxon z-test
Continuous variables												
Credit spread (bps)												
pre-crisis	742	136.9	97.9	-23.87 ***	401	143.5	156.7	-2.44 **	6,981	125.5	197.6	-44.90 ***
crisis	348	329.1	120.5		38	206.5	250.3		3,570	220.3	167.6	
Credit rating [1-22 weak]												
pre-crisis	65	6.9	4.3	-0.40	465	4.3	3.5	0.93	12,353	4.8	2.4	-9.89 ***
crisis	15	7.6	2.2		32	4.0	4.1		3,727	5.4	3.2	
Loan to value (%)												
pre-crisis	1,449	48.7%	39.3%	2.54 **	555	35.7%	35.4%	-1.52	16,673	55.6%	47.0%	-38.93 ***
crisis	1,410	45.8%	39.4%		44	45.5%	36.5%		4,304	86.1%	27.0%	
Time to maturity (years)												
pre-crisis	1,288	14.1	9.5	2.75 ***	555	20.5	14.6	-2.65 ***	16,673	5.0	5.4	-30.58 ***
crisis	1,285	13.0	8.9		44	26.7	16.0		4,304	6.8	7.2	
Tranche size (Euro millions)												
pre-crisis	1,449	124.0	231.3	5.71 ***	555	240.6	509.6	-3.26 ***	16,673	235.7	395.2	-29.20 ***
crisis	1,410	108.2	219.9		44	1,035.9	3,462.4		4,304	431.3	553.3	
Number of tranches												
pre-crisis	1,437	2.9	1.6	-1.88 *	555	4.6	2.8	5.35 ***	16,278	22.9	32.0	37.63 ***
crisis	1,408	3.0	1.7		44	2.5	0.7		4,297	1.5	1.1	
Number of bookrunners												
pre-crisis	723	1.9	1.4	-3.99 ***	555	1.4	0.7	2.36 **	16,669	1.4	0.8	-44.55 ***
crisis	232	2.7	2.8		44	1.2	0.7		4,304	2.5	1.9	
Number of banks												
pre-crisis	1,437	8.0	7.1	10.76 ***	555	2.5	1.9	5.46 ***	16,669	2.8	3.4	-24.79 ***
crisis	1,392	5.7	6.1		44	1.3	0.7		4,304	3.4	3.3	
Country risk [1-22 weak]												
pre-crisis	1,449	1.8	1.4	-13.05 ***	555	1.3	0.8	-7.65 ***	16,673	1.3	1.0	-20.51 ***
crisis	1,410	2.5	1.8		44	2.3	1.6		4,304	1.8	1.8	
Management fee (bps)												
pre-crisis	107	40.8	23.1	-4.83 ***	48	33.1	26.9	-	2,009	22.3	17.9	-0.47
crisis	33	75.7	49.0		0	-	-		226	25.8	25.9	

Table 4.12: The impact of the global financial crisis on the characteristics of PF, AS, and CB tranches: continuous variables.[332] [333]

[332] This table reports statistics for characteristics of PF, AS, and CB issues which are separated into two sub-samples: pre-crisis period and crisis period. The number of observations are reported in the column ‘Number’ and the standard deviation in column ‘Std. Dev.’. ***, **, * indicate that equality of means can be rejected at the 1%, 5%, and 10% significance level, respectively.

[333] Since almost all variables do not follow a normal distribution – with the exception of *credit rating* variable for PF loans in the pre-crisis period sub-sample and maturity variable for AS bonds in the crisis period sub-sample – and the number of observations is small for some of them, we run the Wilcoxon rank-sum test. The Wilcoxon test is a non-parametric test, which assesses the difference in means between the pre-crisis period and crisis period sub-samples based on a one-sided probability.

The evidence regarding credit spread strongly supports the assumption that the average credit spread is statistically and significantly higher for PF loans (329.1 bps *versus* 136.9 bps), AS bonds (206.5 bps *versus* 143.5 bps), and CB (220.3 bps *versus* 125.5) during the crisis period. Thus, we reject the hypothesis (Hypothesis 4) that the crisis do not impact significantly on SF credit spread. These simple sample analyses, however, do not allow us to control for other microeconomic and macroeconomic pricing factors. We thus proceed, in Chapter 5, with regression analysis where we can take these factors directly into account and are thus able to obtain better founded results for our hypothesis.

Variable of interest	Type of loan issue											
	Project Finance				Asset Securitization				Corporate Bonds			
	Number	Number (d=1)	% of total	Fisher's exact test	Number	Number (d=1)	% of total	Fisher's exact test	Number	Number (d=1)	% of total	Fisher's exact test
Dummy variables												
Guarantee												
pre-crisis	888	866	97.5%	0.214	555	555	100.0%	-	16,673	322	1.9%	0.000 *
crisis	1,382	1,334	96.5%		44	44	100.0%		4,304	127	3.0%	
Fixed rate issue												
pre-crisis	749	7	0.9%	0.057	555	143	25.8%	0.101	16,673	13,113	78.6%	0.008 *
crisis	361	9	2.5%		44	6	13.6%		4,304	3,464	80.5%	
Currency risk												
pre-crisis	1,449	186	12.8%	0.002 *	555	186	33.5%	0.000 *	16,673	5,631	33.8%	0.001 *
crisis	1,410	129	9.1%		44	2	4.5%		4,304	1,336	31.0%	
U.K. borrowers												
pre-crisis	1,449	369	25.5%	0.000 *	555	286	51.5%	0.000 *	16,673	2,047	12.3%	0.000 *
crisis	1,410	237	16.8%		44	6	13.6%		4,304	789	18.3%	
Financial institutions												
pre-crisis	1,438	4	0.3%	0.255	555	400	72.1%	0.000 *	16,673	14,255	85.5%	0.000 *
crisis	1,367	8	0.6%		44	44	100.0%		4,304	2,697	62.7%	

Table 4.13: The impact of the financial crisis on the characteristics of PF, AS, and CB tranches: dummy variables.[334]

Taking the remaining variables, we are able to document the following important findings:

1. CB issues have a significant higher credit rating during the crisis period in comparison with the pre-crisis period.
2. Contrary to PF loans, AS and CB issues average maturity and tranche size have increased significantly during the crisis period.

[334] * indicates that there is a statistically significant relationship between the dummy variable and the global financial crisis. Note that the Fisher's exact test does not have a "test statistic", but outputs the p-value directly. The number of observations are reported in the column 'Number' and the number of issues with dummy = 1 in column 'Number (d=1)'.

3. During the crisis period, loans and bonds in Western Europe are located in far riskier countries. This can be explained by the European sovereign debt crisis, which has made it difficult or impossible for some countries in the euro area to re-finance their government debt without the assistance of third parties.
4. PF issues are more likely to have a higher average number of tranches and bookrunners during the crisis period than during the pre-crisis period, when compared with AS and CB issues.
5. During the financial crisis period, all types of issues are much less likely to be subject to currency risk.
6. During the crisis period issuers belonging to the financial industry increased their use of SF instruments (namely AS bonds) as compared with SDF instruments: 100% of the AS tranches are issued by financial institutions during the crisis period, which compare to 72.1% in the pre-crisis period (85.5% *versus* 62.7% for CB).

5. The Pricing of Structured Finance Transactions

5.1. Introduction

Although the academic literature analyzing the credit spread of corporate bonds – considered in our study as straight debt finance (SDF) transactions – is vast and growing, research on the credit spread of structured finance bonds and loans is scant. Empirical studies on the price determinants of project finance loans and asset securitization bonds – both considered in our study as structured finance (SF) transactions – are very limited, but a few can still be found. However, a comparative empirical examination of the price determinants of project finance (PF), asset securitization (AS), and corporate bonds (CB) is something completely new.

In this chapter, we subject the various high-information samples detailed in Tables 4.5, 4.6, and 4.7 (sub-section 4.4.2) to OLS regression analysis. Our purposes for employing OLS regression are four-fold.

First, we intend to determine which of the variables detailed in Tables 4.5, 4.6, and 4.7 have significant and independent effect on credit spreads once the effects of other variables are accounted for. We hypothesized (hypothesis 3) that the impact of pricing factors on credit spread does not differ significantly among and between SF and SDF transactions. Thus, we start our analysis by determining if SF and SDF transactions are priced in the same way, if this equivalent to testing whether PF, AS, and CB issues are priced in segmented or integrated capital markets; i.e., whether the coefficient values and numbers of significant factors are the same for SF and SDF issues.

Second, we aim to determine whether SF transactions are more or less expensive than SDF transactions, after controlling for other factors (hypothesis 2). Third, we intend to determine whether the 2007/2008 financial crisis impacted significantly on SF credit spreads – again, after controlling for other microeconomic and macroeconomic pricing factors (hypothesis 4).

Finally, the term structure of SF and even of SDF transactions appears as a particular puzzle.[335] Therefore, we aim to analyze the pricing of our cross section dataset of loan

[335] For PF loans, Kleimeier and Megginson (2000) conclude that PF loan pricing is not a positive function of maturity. Sorge and Gadanecz (2008) study this apparent absence of a clear relationship between spreads and maturity in PF loans and show that the term structure of credit spreads is 'hump-shaped'.

and bond issues within a multivariate regression framework focusing on the relationship between credit spread and maturity, while controlling for other relevant micro and macro risk factors that also affect the credit spread.

This chapter is organized as follows: The first section introduces the main purpose of this chapter. Section 2 reviews the most prominent papers on loan pricing literature. The third section compares *ex ante* credit spreads among and between SF and SDF issues; i.e., it examines the extent to which SF and SDF transactions are priced by common factors. It starts by presenting the methodology and discussing the sets of variables (micro and macro variables) and their expected impact on the credit spread. Next, it presents the regression analysis results. Section 4 presents a summary and our final conclusions.

5.2. Loan Pricing Literature Review

The academic literature contains numerous loan pricing studies, both theoretical and empirical. As we intend to study the determinants of loan and bond pricing for SF and SDF transactions (i.e., how borrower, transaction-specific factors, and economic factors influence credit spreads), the review of loan pricing literature focuses essentially on empirical studies.[336] Three different streams of empirical research are useful for the purpose of studying the pricing of SF *vis-a-vis* SDF transactions. Regarding SF, the first one refers to empirical studies on the pricing of PF loans and the second refers to

Regarding CB, several authors [e.g., He et al. (2000), Duffie and Singleton (2001), and Sorge and Gadanecz (2008)] argue that, on average, the term structure of credit spreads for investment grade bonds appears upward-sloping. However, the literature has been more controversial regarding the term structure of credit spreads for non-investment grade bonds [Sarig and Warga (1989) and Fons (1987) find downward-sloping term structures of credit spreads for non-investment grade bonds].

[336] Theoretical pricing models are presented, among others, by Merton (1974), Black and Cox (1976), Eaton, Gersovitz, and Stiglitz (1986), Maksimovic (1990), Longstaff and Schwartz (1995), and Duffee (1998). The Merton/Black-Scholes' (MBS) option pricing framework is particularly attractive for the development of a pricing theory for corporate liabilities in general and has been the basis for most loan pricing models. Based on this model, Merton (1974) developed a systematic theory for pricing debt where there is risk of default and concluded that the default risk premium depends on: (i) the risk-free rate on the debt; (ii) the characteristics of the debt contract (e.g., maturity, coupon rate, seniority, etc.); and (iii) the issuers' probability of default. More recently, other studies have presented extended versions of the MBS framework that produced results more in line with empirical investigation. For example, Longstaff and Schwartz (1995) show that credit spreads are strongly negatively correlated with corporate assets with significant exposures to interest rates.

empirical studies on AS bonds pricing. Concerning SDF, the third one refers to empirical studies on CB price determinants.

Scott and Smith (1986), who analyze the effect of the Bankruptcy Reform Act of 1978 on the cost of loan production, find a positive impact of the risk free rate and the loan size on the contract rate and a negative impact of year of incorporation, form of business, and the existence of collateral on contract rates. Melnik and Plaut (1986) find a positive relationship between the risk premium and loan size, thus larger loans have higher interest rates. Contrary to Scott and Smith (1986), Blackwell and Winters (1991) find a positive impact on the spread for the existence of collateral and the loan class. Additionally, they find that the debt-to-equity ratio has a marginally significant positive effect. Negative effects on spread have both size proxies and reputation proxies.

Booth (1992) analyzes the impact of monitoring-related contract costs on bank loan spread and concludes that: (i) total sales, loan size, the existence of price options, the bond rating of the borrower, and the existence of public debt have a negative impact on spread; and (ii) the existence of collateral, the variance of equity returns, the fees on unused balances, the contract structure of the loans commitment, and the use of the loan proceeds for corporate restructuring or for funding an LBO have positive impact on spread.[337] Harjoto et al. (2006) and Bharath et al. (2007) have used firm size to control for credit risk, and have shown that loans to larger borrowers carry lower spreads, everything else equal.

Only a few studies have been developed on pricing PF loans.[338] Kleimeier and Megginson (2000), based on a sample of over 5,000 PF loans within a control group of 90,000 syndicated loans, find that PF loan spreads are directly related to variables such as country risk, the use of covenants in the loan contract, and project leverage. In their paper, they show that PF loans are significantly different from any other types of syndicated loans, with longer maturities, more frequent third-party guarantees, and

[337] Other empirical pricing studies include Berger and Udell (1990), Boehmer and Megginson (1990), Blackwell and Winters (1997), and Chen, Mazumdar, and Yan (2000).
[338] See Dailami and Hauswald (2003, 2007) and Tung et al. (2008) for an analysis of PF bonds pricing determinants.

lower spreads. Finally, the study concluded that a third-party guarantee significantly reduces PF loan spreads, while PF loan pricing is not a positive function of maturity and loan size – in contrast to straight or standard debt financing.[339] Sorge and Gadanecz (2008) detect that whereas credit spreads for both investment-grade and speculative-grade bonds other than project finance are a positive linear function of maturity, in PF loans the term structure of credit spreads is 'hump-shaped'. The authors emphasize several key features of PF transactions that might explain this finding, namely: (i) the 'sequential resolution of risks' in fairly predictable risk advancement phases; and (ii) higher leverage decreasing over time.

Further evidence on pricing of PF loans is provided by Corielli et al. (2010), who demonstrate that lenders rely upon the network of nonfinancial contracts (NFCs) as a mechanism to control agency costs and project risks. They point out that (1) effective ring fencing via NFCs (contract design prevents agency problems and establishes an effective risk management package) causes a drop of 19 bps in the credit spread charged; (2) a project located in a country with higher rating pays lowers credit spreads; and (3) industrial sectors do not influence the level of credit spread. Blanc-Brude and Strande (2007) argue that, in a PF transaction, lenders should price any risk that is not explicitly managed through contracts. Based on a sample of 125 EU Roads PPPs and 177 UK PFI PPPs, closed between 1994 and 2005, they conclude that: (1) maturity, which is a major systematic driver of the cost of debt in standard corporate finance, has a marginal effect on PPPs; (2) tranche size is not a driver in PPPs; and (3) when risks other than systematic risks are not managed through contracts and project design, debt spreads reflect the unallocated portion of risk.

Syndication is also presented as playing a potential role in driving the credit spreads in PF loans. Esty and Megginson (2000, 2003) show a positive relation between syndicate size (and concentration) and loan pricing. On the contrary, Strahan (1999), Kleimeier and Megginson (2000), and Sorge and Gadanecz (2008) report that the presence of larger syndicates reduces credit spreads. Gatti et al. (2007) show that certification by prestigious lead arranging banks can create economic value by reducing loan spreads compared to loans arranged by less prestigious arrangers. They also find a correlation

[339] For example, Flannery (1986) indicates that longer maturity loans would have higher credit risk.

between more leveraged projects and larger loans when they are syndicated by prestigious mandated lead arrangers.[340] However, they do not reveal statistical significance for the relationship between project risks and loan spread. Finally, the nationality and the type of banks involved in the syndicate may also influence the credit spread. Esty (2004c) shows that loan spreads are positively related to the fraction of funds provided by foreign banks; i.e., sponsors pay significantly more if they choose foreign banks to finance their projects. Harjoto et al. (2006) show that investment banks charge higher spreads than commercial banks.

Compared with the large amount of empirical studies on CB credit spreads, research on AS bond credit spreads has been scant.[341] Virtually all of the empirical studies on CB credit spreads have found credit ratings to be one of its most important determinants. Some of the more recent papers include Arvantis, Gregory, and Laurent (1999), Duffie and Singleton (1999), Elton et al. (2001), Collin-Dufresne, Goldstein, and Martin (2001), Huang and Huang (2003), Hull, Predescu, and White (2004), and Gabbi and Sironi (2005). In searching for determinants of CB credit spreads, researchers also found other factors to be important, like liquidity, systematic risk, incomplete accounting information, and taxes. An important stream of the literature analyzes the relationship between spread and maturity.[342] Several authors [e.g., Jones et al. (1984), Sarig and Warga (1989), He et al. (2000), Duffie and Singleton (2001), and Sorge and Gadanecz (2008)] argue that lenders get a higher remuneration for being exposed to risk for a longer period of time; i.e., on average, the term structure of credit spreads for investment grade bonds appears upward-sloping. However, the literature has been more controversial regarding the term structure of credit spreads for non-investment grade bonds. Contrary to Sarig and Warga (1989) and Fons (1987), who find downward-sloping term structures of credit spreads for non-investment grade bonds, Helwege and Turner (1999) conclude that spread curves for B- and BB- rated US industrial issues are actually upward-sloping. The same line of reasoning is presented by He et al. (2000),

[340] They also find that: (1) loans with currency risk have statistically lower spreads; (2) longer term loans have stable spreads; and (3) spreads differ across industries.
[341] As pointed out by Hu and Cantor (2006) "*[T]his is largely due to the lack of some economic models and reliable data for pricing complex and relatively less liquid structured securities.*"
[342] Most of the empirical literature on the term structure of credit spreads has so far concentrated on CB.

who confirm that BB- and B- rated firms mostly show upward-sloping term structure of credit spreads, whereas only curves for CCC- or CC- rated firms are downward-sloping. After controlling for micro and macro risk factors, Sorge and Gadanecz (2008) find that for non-project finance bonds and loans, the term structure of credit spread can be represented by a linear positive function of maturity, either for investment grade or non-investment grade issues.[343]

The analysis of AS bond credit spreads relies on the determination of the risk and value of pooling and tranching, based on historical data and projected cash flow distributions.[344] Rothberg et al. (1989) argue that liquidity and credit risk significantly affect the pricing of pass-through securities. Maris and Segal (2002) study the determinants of credit spread on CMBS and find that (i) default probability, (ii) tranche size (with a negative slope), (iii) transaction size (larger deals are associated with higher spread), and (iv) year (credit spread decrease from year to year) influence CMBS credit spreads. Ammer and Clinton (2004) find that rating downgrades are accompanied by negative returns and widening spreads.

Firla-Cuchra (2005) argues that credit rating is the most important pricing factor for this asset class at issue. This idea is corroborated by Gorton and Souleles (2005), who find that the sponsor's credit rating has an impact on the issuance spread of senior tranches of credit card securitizations. Vink and Thibeault (2008) examine how common pricing factors compare for the main classes of securitization securities; i.e., ABS, MBS, and CDO issues. They demonstrate that the credit spread is influenced differently by common pricing factors and they find that default and recovery risk characteristics are the most important variables explaining loan spread variability. Consistently with Firla-Cuchra (2005) and Hu and Cantor (2006), the authors present credit rating as the most significant factor in determining credit spread at issue – the credit spread rises when the rating worsens. Hu and Cantor (2006) also point out that securities with higher issuance spreads in a given rating category may indicate higher downgrade risk.

[343] The authors find that the difference in the shape of the term structure of investment grade *versus* non-investment grade bonds, as commonly reported in the literature, largely disappears.

[344] This analysis is often complicated by the strong interactions of a number of joint risk factors that determine the credit spread, namely [Hu and Cantor (2006)]: (i) credit risk; (ii) prepayment risk; (iii) liquidity risk; (iv) legal or regulatory risk; (v) maturity risk; and (vi) sponsor and servicer risk.

Buscaino et al. (2009) interrelate AS and PF issues studying the issue of collateralized loan/debt obligations (CLOs/CDOs) based on a portfolio of PF loans. The authors reveal that credit rating and the nature of the underlying assets are the most important determinants of CDO pricing at close.

In short, the existing loan pricing models are not completely successful in explaining what determines the cost of debt in SF transactions. Lenders may either seek compensation for risk through credit spreads and fees or use other non-price characteristics like maturity, size or collaterals when lending to risky borrowers.

5.3. A Comparative Analysis of *Ex Ante* Credit Spreads: Structured Finance *versus* Straight Debt Finance

5.3.1. Data and Methodology

This section examines the extent to which SF and SDF transactions are priced by common factors; i.e., we intend to analyze the impact of the common pricing features on credit spread by type of issue class. In hypothesis 3, we hypothesize that the impact of pricing factors on credit spread does not differ significantly among and between SF and SDF transactions. Various different variables determine credit spreads, and it may well be that the impact of these variables on the credit spreads is different among and between SF (PF and AS issues) and SDF transactions (CB issues). According to statistics, relevant pricing variables can be identified by their statistical significance, while the equality of the impact of each variable can be determined by comparing coefficient values.

A test of structural change will be used to test hypothesis 3. The classical test of structural change is the Chow test, also defined as an econometric test used to determine whether the coefficients in a regression model are equal in separate sub-samples.[345] To implement the Chow test we first run one ordinary least squares regression on the

[345] See Chow (1960) and Davidson and Mackinnon (1993) for further explanation.

common pricing variables (independent variables) and the credit spread (dependent variable), under the assumption that all types of issues (PF, AS and CB issues) have the same explanatory variables. Second, coefficients from separate regressions are obtained from each type of issue, and we run thus three regressions: one for PF loans, one for AS bonds, and one for CB. Then, based on the residual sum of changes of each regression, an *F*-test of structural change is computed (also called a Chow test). Finally, hypothesis 3 will be rejected if the computed *F* value exceeds the critical value, and will be accepted if the *F* value remains smaller than its critical level.

Should hypothesis 3 be accepted, examining the coefficients will allow us to determine loan pricing factors for AS, PF, and CB issues; i.e., a regression test will be run on one sample only to determine the pricing variables. If it is the case that hypothesis 3 is rejected, regressions on AS, PF, and CB will be run to examine the relationship between the pricing variables and the credit spread for each type of loan issue separately for comparison.

Considering the discussion in sections 4.4 and 5.2, the credit spread on SF and SDF is modeled as a function of microeconomic variables. Additionally, we control for the macroeconomic conditions (e.g., level of interest rates, volatility, slope of the Euro swap rate).[346] The data on macroeconomic variables are obtained from DataStream. We linked the macroeconomic variables and the microeconomic information contained in the loans (DealScan) and bonds (DCM Analytics) databases on the active date (PF loans) or issue date (AS and CB issues). The main problem in choosing a set of variables for each type of issue is the requirement that each set must be meaningful for PF, AS, and CB issues. For example, whether or not the issue is retained in an AS transaction, it has no counterpart in CB and even in PF issues. Thus, it cannot be included in the model. Several variables were available for the three types of financing instruments used, which allows us to directly compare the main pricing factors for SF and SDF instruments.

We estimate the determinants of loans and bonds pricing using the model described in equation 5.1. The dependent variable is the credit spread, in basis points, and the

[346] We identified the possible variables to use as instruments for the credit spread based on the available literature [in particular, Kleimeier and Megginson (2000), Altunbas and Gadanecz (2004), Gatti el al. (2007), Sorge and Gadanecz (2008), and Vink and Thibeault (2008)], and furthermore the opinions collected during verbal discussions with top investment banks confirms our choices.

independent variables are those presented and described in the next sub-section. We employ standard OLS regression techniques and adjust for heteroskedasticity using the methodology proposed by Huber (1967) and White (1980).[347] The model estimated is:

$$\begin{aligned} Credit\ spread_i = \alpha &+ \beta_1\ Log\ transaction\ size_i + \beta_2\ Log\ loan\ to\ value_i + \beta_3\ Maturity_i \\ &+ \beta_4\ Number\ of\ tranches_i + \beta_5\ Number\ of\ banks_i + \beta_6\ Country\ risk_i \\ &+ \beta_7\ Currency\ risk_i + \beta_8\ U.K.borrowers_i + \beta_9\ Crisis_i + \beta_{10}\ Risk\ \ free\ rate_i \\ &+ \beta_{11} Volatility_i + \beta_{12}\ EUSA5y - Libor3m_i + \beta_{13} Commercial_i + \beta_{14}\ Industrial_i \\ &+ \beta_{15} Utilities_i + \beta_{16} Transportation_i + \beta_{17}\ Government + \beta_{18}\ Other + \varepsilon_i \end{aligned} \tag{5.1}$$

From the total sample of PF loans, CB and AS instruments, we collect all tranches for which credit spread information is available (high-information samples). This results in a total of 1,090 observations for PF, 439 for AS, and 10,551 for CB (see Tables 4.5, 4.6, and 4.7 in sub-section 4.4.2).

For credit spread, we first estimate a complete model using all independent variables presented in equation 5.1 and seven new models, each including one key additional variable at a time, to test the influence of each one on the dependent variable. Thus, the following variables will be included separately in our regression models: (i) *Rating*, *Management fee*, and *Credit accessibility* due to their limited number of observations; (ii) *Upfront fee* because it is available for PF loans only; (iii) *Collateral* because it is available for AS bonds only; and (iv) *Fixed rate* and *Callable* because they are available for AS and CB issues only.

In the next sub-section, we present the sets of variables and their expected impact on the SF and SDF credit spreads.

[347] We use the Huber-White-sandwich estimator of the variance of the linear regression estimator. The names Huber and White refer to the seminal references for this estimator. Huber (1967) and White (1980) independently derived this estimator, and the name ‘sandwich’ refers to the mathematical form of the estimate, namely, that it is calculated as the product of three matrices: the matrix formed by taking the outer product of the observation-level likelihood/pseudolikelihood score vectors is used as the middle of these matrices (the meat of the sandwich), and this matrix is in turn pre- and postmultiplied by the usual model-based variance matrix (the bread of the sandwich). For further discussion of this subject see Froot (1989), Wooldridge (2002), and Baum (2006).

5.3.2. Structured and Straight Debt Finance Pricing Factors

Comparing the empirical studies reviewed in section 5.2., it is evident that each study employs a different set of explanatory variables according to its research objective. Some variables associated with the loan or bond are used in all regressions, whereas variables describing the macroeconomic environment differ significantly. With respect to loan variables, size, maturity, collateral, and sector are commonly used. With respect to macroeconomic factors, empirical studies commonly use the risk free rate, inflation, currency risk, and country risk.

Next, we present the two sets of variables and their expected impact on the credit spread. Table 5.1 gives an overview of the variables and their expected sign and Annex 9 presents a further discussion of variables and their expected impact on the cost of funding, taking into consideration the existing theoretical and empirical literature.

5.3.2.1. Dependent Variable

Credit spread is defined as the price for the risk associated with the financing instrument, on the basis of available information, at the time of issue. For bonds, the credit spread is defined as the margin yielded by the security at issue on a corresponding currency treasury benchmark with a comparable maturity. For PF loans, the credit spread represents the spread paid by the borrower over 3-month Euribor (the three-month Euro Interbank Offered Rate) or 3-month Libor (the three-month London inter-bank offered rate). To allow us to compare the credit spread across loans and bonds we adjust for the risk difference of the bond and loan benchmarks, by adding to the Euribor or Libor spread of the PF loans, the difference between the three-month Euro Libor and the three-month German Treasury bill at the time when the loans were granted.[348] Additionally, as loans are priced over a three month rate, while bonds tend to be priced off longer-term benchmarks, we include as an additional control in our regression, the slope of the Euro swap curve as the difference between the 5-year Euro swap rate and the 3-month Libor at the time of the signing of the loan or issuing of the bonds [following the approach presented by Thomas and Wang (2004) and Sorge and Gadanecz (2008)].

[348] For further discussion of how credit spreads were computed see sub-section 4.4.2.

5.3.2.2. Microeconomic Variables

From the literature, several variables emerge as relevant in affecting the credit spread of PF, AS, and CB issues. We use the following microeconomic variables in this study: (i) *Log transaction size*; (ii) *Log loan to value*; (iii) *Maturity*; (iv) *Number of tranches*; (v) *Currency Risk*; (vi) *Number of banks*; (vii) *U.K. borrowers*; (viii) *Sector* (*Commercial*; *Industrial*; *Utilities*; *Financial Institutions*; *Transportation*; Government; *Other*); (ix) *Rating*; (x) *Management fee*; (xi) *Upfront fee*; (xii) *Collateral*; (xiii) *Fixed rate*; and (xiv) *Callable*.[349] [350]

5.3.2.3. Macroeconomic Variables

The pricing of SF loans and bonds might be significantly affected by several sources of macroeconomic factors. One weakness of existing studies of PF loans and AS bonds is their lack of control for macro determinants. We start by using eighteen dummy variables (Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxemburg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland) to capture systematic differential effects relative to the U.K. We also included a measure of inflation to reflect lenders' perceptions of inflation risk. However, adding these variables did not add significant explanatory power to the model. Hence, these were excluded from the final specifications.

A second group of variables in our regression model is thus intended to reflect these macro effects, namely: (i) *Country risk*; (ii) *Crisis*; (iii) *Risk free rate*; (iv) *Volatility*; (v) *EUSA5y-Libor3M*; and (vi) *Credit accessibility*.[351]

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[349] For a more thorough explanation of microeconomic variables see sub-section 4.4.2 and Annex 9.
[350] It is important to notice that some variables were not included in the AS bond credit spreads analysis because of lack of information. An example is credit enhancement, which may refer to issues with a third-party guarantee in the form of, e.g., an insurance policy used by one of the monoline insurance companies. Additionally, some variables discussed in Chapter 4 were excluded from our regression analysis. Guarantee was excluded due to multicolinearity problems in the AS high-information sample. The number of bookrunners was also excluded because it showed an insignificant impact on SF and SDF credit spreads and would remove a significant number of observations.
[351] For a more thorough explanation of macroeconomic variables see Annex 9.

Name	Description	Expected Sign PF	Expected Sign AS	Expected Sign CB
Dependent variable:				
Credit spread	For loans: Libor spread plus difference between three-month Libor and three-month German Treasury yield at the time of the signing of the loan. For bonds: spread at issue over comparable risk-free government security with a comparable maturity.			
Independent variables:				
Microeconomic independent variables				
Log transaction size	Natural log of the loan or bond transaction size. Transaction size is converted into Euro millions when necessary.	- / I	-	?
Log loan to value	Natural log of the loan to value ratio, which represents the ratio of the tranche size to the transaction size of a given loan or bond.	+	- / I	+
Maturity	Maturity of loan or bond, in years.	?	- / I	?
Number of tranches	The number of tranches for each transaction.	+	-	+
Number of banks	The number of financial institutions participating in the loan or bond issuance.	?	- / I	-
Currency risk	Dummy equal to 1 for loans that are denominated in a currency different from the currency in the borrower's home country. Dummy equal to 1 for bonds that are denominated in a currency different from the currency in the deal's nationality.	-	+	+
U.K. borrowers	Dummy equal to 1 if the borrower/issuer belongs to U.K.	-	-	-
Sector	Dummies equal to 1 if loan or bond finances a borrower/issuer in a certain industry. For each of the following industry groups, a dummy is created: commercial, industrial, utilities, transportation, government, and other. The control group includes financial institutions.	?	+	?
Rating	Loan and bond rating based on the S&P and Moody's rating at close. If missing for loans, S&P and Moody's senior debt rating at close are used. If both rating are available, the average rating is calculated. The rating is converted as follows: AAA=Aaa=1, AA+=Aa1=2, and so on until D=22.	+	+	+
Management fee	Fees (in bps) that are periodically paid to the bank syndicates.	+	+	+
Upfront fee	A fee (in bps) paid by a borrower to a bank or a syndicate of banks for arranging a PF loan.	+	NA	NA
Collateral	Dummy equal to 1 if an AS bond is backed by mortgages and 0 otherwise.	NA	-	NA
Fixed rate	Dummy equal to 1 if a loan or bond is fixed price and 0 otherwise.	+	+	+
Callable	Dummy equal to 1 if the bond has a call option and 0 otherwise.	NA	+	+
Independent variables:				
Macroeconomic independent variables				
Country risk	S&P's country credit rating at close. The rating is converted as follows: AAA=1, AA+=2, and so on until D=22.	+	?	+
Crisis	Dummy equal to 1 if the issue date belongs to the crisis period and 0 otherwise.	+	+	+
Risk free rate	The three-month German Treasury bill at the time of the signing of the loan or issuing the bonds - a proxy for the general level of interest rates.	I	+	+
Volatility	The Chicago Board Options Exchange Volatility Index (VIX). VIX reflects a market estimate of future volatility.	+	+	+
EUSA5y-Libor3M	The slope of the Euro swap curve. Obtained as the difference between the five-year Euro swap rate and the 3-month Libor rate.	?	-	-
Credit accessibility	The iTraxx Europe index. iTraxx is used as a proxy for credit conditions and therefore for credit accessibility by borrowers.	+	+	+

Table 5.1: Definition of variables and their expected sign.[352]

[352] The following characters in Table 5.1 mean: – = negative impact on the credit spread | + = positive impact on the credit spread | I = insignificant impact on the credit spread | ? = sign cannot be clearly determined from either the theoretical or empirical literature | NA = information about this variable is not available | HS = hump-shaped.

5.3.3. Analysis and Results

5.3.3.1. Determinants of Credit Spreads for the High-Information SF and SDF Samples

A Chow test of structural change is used to test the hypothesis that SF and SDF transactions are functionally equivalent financial instruments priced in a single market; i.e., we use a Chow test to investigate whether the credit spread associated with SF (PF loans and AS bonds) and SDF (CB) issues are influenced differently by common pricing factors (Hypothesis 3). In essence, we are testing whether the pricing factors used in equation 5.1 are significant in both SF and SDF transactions and, if so, whether they have the same coefficient values. When running the ordinary least squares regressions for computing Chow statistics we adjusted for heteroskedasticity using the methodology proposed by Huber (1967) and White (1980). Table 5.2 examines whether the three financial instruments are priced in segmented or integrated capital markets.

Type of loan issue	PF	AS	CB
PF	-	-	-
AS	6.62	-	-
CB	37.67	6.77	-

Table 5.2: Chow test for differences in pricing factor coefficients.[353]

Hypothesis 3 has to be rejected because the Chow test statistics in Table 5.2 are all higher than the critical levels. The credit spread associated with PF, AS, and CB issues are influenced differently by common pricing factors. Following our analysis, we may conclude that: (i) SF and SDF transactions are distinct financial instruments; and (ii) PF loans and AS bonds are financial instruments influenced differently by common pricing factors. Thus, they are not priced in a single integrated market and we cannot estimate the full sample of loans and bonds in a single regression. This also means that we cannot directly test whether the spread on SF is lower than or equal to the credit spread on SDF (Hypothesis 2) by including a PF and an AS dummy variable in a regression of a sample of all loan types.[354]

[353] This table shows the results obtained when a Chow test was used to determine whether the samples could be pooled into a single sample. All the reported test statistics are larger than the corresponding critical values. The test statistic follows the F distribution with k and N_1+N_2-2k degrees of freedom.
[354] However, and based on our univariate analysis, we conclude (see sub-section 4.4.3) that average credit spreads are statistically and significantly higher for PF loans than they are for AS bonds and CB. On the

Considering that we reject Hypothesis 3, next we examine the determinants of credit spreads for each type of issue using ordinary least squares regression framework. Table 5.3 presents the results of estimating equation 5.1 using each of the three high-information samples discussed in sub-section 4.4.2 (see Tables 4.5, 4.6, and 4.7). *F*-statistics on whether coefficients are jointly different from zero, as well as adjusted R^2 are reported at the bottom of the Table 5.3.

Dependent variable: Credit spread (bps)	[1a] All PF Loans	[1b] All AS Bonds	[1c] All CB
Independent variables:			
Intercept	257.66 ** (9.43)	113.44 * (2.37)	81.57 ** (7.78)
Log transaction size	-19.52 ** (-4.93)	-6.75 (-1.52)	-8.80 ** (-6.43)
Log loan to value	4.37 * (2.04)	-40.91 ** (-5.48)	
Maturity	0.51 (1.67)	-0.72 (-1.52)	-1.12 ** (-3.87)
Number of tranches	-1.02 (-0.56)	-3.08 (-0.95)	19.62 ** (36.87)
Number of banks	1.42 ** (3.87)	-9.36 ** (-2.58)	-1.63 ** (-3.47)
Country risk	7.78 ** (2.91)	-12.80 (-1.04)	0.46 (0.29)
Currency risk	38.11 ** (2.88)	16.95 (0.79)	3.01 (0.60)
U.K. borrowers	49.85 ** (5.23)	10.39 (0.46)	17.49 ** (3.41)
Crisis	174.01 ** (16.26)	121.25 * (2.43)	77.41 ** (15.43)
Risk free rate	-0.16 ** (-4.46)	0.12 (1.28)	
Volatility	0.49 (1.64)	2.25 * (2.13)	2.06 ** (9.91)
EUSA5y-Libor3M	-0.46 ** (-7.41)	-0.45 ** (-3.30)	-0.02 (-0.60)
Commercial		101.80 ** (3.28)	102.44 ** (17.20)
Industrial	10.29 (1.14)	57.95 (1.56)	98.75 ** (19.30)
Utilities	12.92 (1.41)	-16.49 (-0.42)	20.66 ** (4.17)
Transportation	14.33 (1.39)	128.94 (1.88)	68.80 ** (5.94)
Government	7.18 (0.31)		14.93 (0.38)
Other			163.47 ** (5.83)
Number of observations	1,029	439	10,543
Adjusted R^2	0.51	0.19	0.21
F	90.00	6.55	238.24

Table 5.3: Regression analyses of the determinants of credit spreads.[355] [356]

contrary, average credit spreads for AS and CB issues do not differ significantly at 5% significance level. Therefore, we accept only the hypothesis that the credit spread on SF is lower than or equal to the credit spread on SDF for AS issues (Hypothesis 2).

[355] Table 5.3 presents an ordinary least squares regression analysis of the determinants of loans and bonds credit spread for SF (PF and AS) and SDF (CB) samples. The *t*-statistics reported in parentheses are

The regression intercepts for each type of loan issue show – although a direct comparison is not possible since some of the variables are omitted because of collinearity –, as pointed out in the univariate analysis (Table 4.9), the highest credit spread for PF loans in Western Europe when compared to AS and CB issues. This finding, coupled with the univariate test results (Table 4.10) – average credit spreads are statistically and significantly higher for PF loans (198.3 bps) than they are for AS bonds (148.9 bps) and CB (157.6 bps) – shows that PF loans have significantly higher credit spreads than AS and CB issues. These findings are contrary to those of Kleimeier and Megginson (2000), who find that PF loans have significantly lower spreads than other syndicated loans (corporate control; capital structure; and general corporate purpose). However, this is in line with the prediction of Fabozzi et al. (2006), who present higher costs of borrowing when compared to conventional financing as one of the major disadvantages of project finance. PF transactions have some drawbacks, particularly as they are costly to set up, take a long time to execute, and are highly restrictive once in place.[357]

The second line of Table 5.3 details the influence of transaction size on credit spread, which is insignificant for AS but negative and significant for PF and CB.[358] This suggests that increasing the transaction size by 100 M€ will reduce the required credit spread by 89.89 basis points (bps) and 40.53 bps for PF loans and CB, respectively. One could interpret this significant negative relationship between transaction size and credit spread as evidence of a positive price liquidity effect related to the size of the entire issue.

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based on heteroskedasticity-consistent standard errors. ** and * indicate that the reported coefficient is statistically significant at the 1% and 5% level, respectively.

[356] Variable log tranche size was omitted because of collinearity for all the regressions. We used this variable instead of the natural log of transaction size and the results remain the same. The following variables were also omitted because of collinearity: (i) *commercial* and *other* dummy variables in estimating model [1a]; and (ii) *log loan to value* and *risk free rate* in estimating model [1c]. *Government* and *other* dummy variables do not exist for AS transactions.

[357] Similarly, Gatti (2008) states that the principal drawback of project finance is that structuring such a deal is more costly than the corporate financing option. The author presents the following reasons: "*1. The legal, technical, and insurance advisors of the sponsors and the loan arranger need a great deal of time to evaluate the project and negotiate the contract terms to be included in the documentation; 2. The cost of monitoring the project in process is very high; 3. Lenders are expected to pay significant costs in exchange for taking on greater risks.*"

[358] We expected a significantly negative relationship between credit spread and transaction size for AS transactions. However, our results are different from the results presented by Vink and Thibeault (2008), who find that transaction size has a significantly negative relationship with spread for ABS and MBS.

Loan to value ratio behaves differently for PF loans than for AS bonds. Whereas spread and loan to value are significantly, positively related for PF loans, they have a significant negative relationship for AS bonds. These results are in line with the expected coefficient sign for PF and AS issues. AS bonds demonstrate a larger coefficient compared to PF loans, which means that lenders associate an increase in the loan to value ratio with a significant reduction of credit risk for these types of securities.

Whereas credit spread and maturity are significantly, negatively related for CB issues, they have insignificant relationship for PF and AS issues. The coefficient value indicates that issuing a CB, with an original maturity one year longer than the median, decreases credit spread by 1.12 bps. Considering that the literature has been controversial regarding the term structure of credit spreads for PF and CB issues, these findings merit greater in-depth analysis into the nature of assets and cash flows related to each type of issue. Sub-section 5.3.5 presents further discussion on the term structure of SF and SDF credit spreads.

The number of tranches has an insignificant relationship with credit spread across SF transactions, but significant for CB issues. Thus, we do not find any support that issuers exploit market factors to their advantage via tranching of AS bonds. For CB issues, as expected, riskier transactions imply a higher number of tranches as each investor is available to constitute a lower share in their portfolio; i.e., an issuer will benefit from more tranches in the transaction especially in the situation of a higher degree of information asymmetry between issuer and investors. Our results are consistent with those presented in literature and empirical studies for CB issues.

The variable number of banks behave differently for PF loans than for AS and CB issues. Whereas credit spread and number of banks are significantly and positively related for PF loans, they have a significantly negative relationship for AS and CB issues. The need for a higher number of banks in arranging a PF transaction can possibly be associated with an increase in risk and thus an extra premium is demanded. For AS and CB issues, a larger number of banks involved is able to lower the spread once investors associate a larger number of banks with an increase in the certification of the transaction.

The country risk variable is significantly positive for PF loans, indicating that lending to a borrower located in a country with a rating of AAA (AAA=1) *versus* one with a rating of BB+ (BB+=11) will increase loans credit spread by 77.80 bps. On the contrary to what we expected based on empirical literature [e.g., Kleimeier and Megginson (2000)], currency risk dummy has a significant, positive relationship with the credit spread for PF loans. This finding for Western European PF transactions suggests that a mismatch in the currency of the borrower's home country and the currency of the PF loan repayment significantly increases the rate charged on an average loan by 38.11 bps.

We expected borrowers from the U.K. to raise funds at a lower spread compared to borrowers from continental Europe. However, U.K. borrowers' dummy variable is significantly positive for both PF and CB issues, indicating that lending to a borrower located in U.K. *versus* one in Continental Europe will increase credit spreads by 49.85 bps and 17.49 bps for PF and CB issues, respectively.

As expected, the 2007/2008 financial crisis and the subsequent European sovereign debt crisis have imposed a significant increase in credit spreads of all the types of financing. A transaction with the issue date or active date belonging to the crisis period will have a higher average credit spread of 174.01 bps, 121.25 bps, and 77.41 bps for PF, AS, and CB issues, respectively.

The risk-free rate has an insignificant relationship with AS bonds credit spread, but a significantly negative relationship with PF loans credit spread. Our finding for PF loans are contrary to those of Blanc-Brude and Strange (2007), who find for a sample of EU and UK PPPs that risk-free rate variable proves to have no statistically significance on the pricing of PF tranches.

The variable volatility behave differently for PF loans than for AS and CB issues. Whereas credit spread and volatility are significantly and positively related for AS and CB issues, they have an insignificant relationship for PF loans. In the presence of higher volatility, AS and CB issuers will pay a higher return. The finding for PF loan credit spreads can be explained by the fact that PF loans are not traded on a secondary market and thus are not subject to a change in value over time.

Credit spread and the slope of the Euro swap curve are significantly and negatively related for SF transactions; i.e., a steeper Euro swap curve is associated with lower credit spreads. This suggests that SF credit spread contains strong systematic risk components. On the contrary, the relationship between credit spreads and the slope of the Euro swap curve is insignificant for SDF transactions. Our results are in line with those of Hu and Cantor (2006), but contrary to those of Sorge and Gadanecz (2008).

The last six variables are dummy variables resulting from the categorical variable sector. The control group includes financial institutions. Thus, the interpretation of the coefficients for sector dummy variables (*Commercial*, *Industrial*, *Utilities*, *Transportation*, *Government*, and *Other*) occurs with reference to that omitted variable. We discover, in line with Corielli et al. (2010), that sector does not influence the level of credit spreads in PF transactions. While the commercial dummy variable has a significantly positive relationship with AS bond credit spreads, industrial, utilities, and transportation dummy variables have insignificant coefficients. This means that in model [1b] the predicted credit spread is approximately 108.80 bps higher for issuers belonging to the commercial sector than in the financial institutions sector. For CB issues, and with the exception of the government dummy variable (the coefficient is insignificant), all other sector dummy variables have predicted credit spreads higher than those for the financial institutions sector or industry.

DealScan and DCM Analytics databases provide varying information about individual loans and bonds, respectively. Depending upon factors such as sector, nationality of borrower, the facility type (e.g., term loan, bridge loan, and revolver) for PF loans and factors such as deal type (e.g., corporate bond investment-grade, corporate bond high-yield, asset-backed security, and mortgage-backed security), sector, issuer nationality, and issue type (e.g., public transaction *versus* private placement) for AS and CB issues, databases provide varying amounts of information. Thus, information on rating, fee level, type of interest rate, credit accessibility, if the bond is callable, and collateral is available only for some of the transactions belonging to our high-information sub-samples. Rather than restrict ourselves to analyzing a single sample with all of this information available (which, e.g., yield a sample size of less than 39 loans for PF transactions), we study and compare several different PF, AS, and CB sub-samples, grouped based on the availability of key data items. These samples and their comparison with our first regression analysis are presented in Annex 7 (models grouped by new introduced variables) and Annex 8 (models grouped by issue type). Additionally, the impact of the 2007/2008 financial crisis and the subsequent European sovereign debt crisis on SF credit spreads is presented in sub-section 5.3.4. The analysis of the relationship between credit spread and maturity, while controlling for other relevant micro and macro risk factors, will be conducted in sub-section 5.3.5.

5.3.3.2. The Impact of Credit Risk on SF and SDF Credit Spreads

It is difficult to obtain credit risk information for PF loans. This is because the information about the credit rating for PF loans at close provided by DealScan is scant when compared with the credit rating information provided by DCM Analytics database for AS and CB issues. Models [2a], [2b], and [2c] present loan pricing regression results for a sample of 39 PF loans, 364 AS bonds, and 8,686 CB with a credit rating at close from either Standard & Poor's (S&P) or Moody's. We compare these results with those obtained from the estimation of equation 5.1, using each of the three high-information samples (models [1a], [1b], and [1c]).

Models [2a], [2b], and [2c] in Table 5.4 show exactly the results expected; i.e., the higher the credit risk of the borrower or issuer the higher the credit spread.[359] However, the impact of a credit rating on the spread differs substantially from loan type to loan type. A one unit increase in credit rating (corresponding to a downgrade from AAA to AA+) is associated with an increase of 7.37 bps, 27.44 bps, and 29.06 bps in PF, AS, and CB issues credit spread, respectively. Note also that inclusion of a direct measure of credit risk has a considerable impact on the regressions intercept, causing a reduction of 154.00 bps for PF loans, 100.17 bps for AS bonds, and 220.92 bps for CB.

Considering SDF (CB) issues, model [2c] yields an adjusted R^2 value of 0.43, which compares with a value of 0.21 for model [1c]. This shows, as referred virtually by all of the empirical studies on CB, that credit ratings are one of the most important determinants of CB credit spreads.

[359] *Rating* variable is statistically significant at the 1% level. Thus, the pattern of rating variable indicates that credit spreads rise when ratings worsen for all three types of financial instruments.

Dependent variable: Credit spread (bps)	[1a] All PF Loans	[2a] PF Loans with rating	[1b] All AS Bonds	[2b] AS Bonds with rating	[1c] All CB	[2c] CB with rating
Independent variables:						
Intercept	257.66 **	103.66	113.44 *	13.27	81.57 **	-139.35 **
	(9.43)	(1.08)	(2.37)	(0.31)	(7.78)	(-14.39)
Log transaction size	-19.52 **	16.81	-6.75	3.74	-8.80 **	0.75
	(-4.93)	(1.13)	(-1.52)	(0.92)	(-6.43)	(0.58)
Log loan to value	4.37 *	10.44	-40.91 **	0.79		
	(2.04)	(1.32)	(-5.48)	(0.10)		
Maturity	0.51	-0.59	-0.72	-0.36	-1.12 **	1.00 **
	(1.67)	(-0.69)	(-1.52)	(-0.67)	(-3.87)	(4.60)
Number of tranches	-1.02	7.68	-3.08	2.39	19.62 **	23.97 **
	(-0.56)	(1.32)	(-0.95)	(0.86)	(36.87)	(9.10)
Number of banks	1.42 **	0.32	-9.36 **	-8.24 *	-1.63 **	-1.65 **
	(3.87)	(0.26)	(-2.58)	(-2.10)	(-3.47)	(-4.35)
Country risk	7.78 **	-13.97	-12.80	-4.99	0.46	-2.04
	(2.91)	(-1.48)	(-1.04)	(-0.74)	(0.29)	(-1.51)
Currency risk	38.11 **	4.24	16.95	35.36	3.01	27.46 **
	(2.88)	(0.19)	(0.79)	(1.96)	(0.60)	(6.64)
U.K. borrowers	49.85 **		10.39	-10.10	17.49 **	6.43
	(5.23)		(0.46)	(-0.53)	(3.41)	(1.58)
Crisis	174.01 **	78.50	121.25 *	33.70	77.41 **	86.53 **
	(16.26)	(1.30)	(2.43)	(0.74)	(15.43)	(20.73)
Risk free rate	-0.16 **	-0.33 *	0.12	-0.03		
	(-4.46)	(-2.24)	(1.28)	(-0.31)		
Volatility	0.49		2.25 *	2.42 **	2.06 **	2.98 **
	(1.64)		(2.13)	(2.81)	(9.91)	(17.88)
EUSA5y-Libor3M	-0.46 **	-0.45	-0.45 **	-0.52 **	-0.02	-0.16 **
	(-7.41)	(-1.98)	(-3.30)	(-4.35)	(-0.60)	(-6.31)
Commercial			101.80 **	25.01	102.44 **	-17.93 **
			(3.28)	(0.99)	(17.20)	(-3.82)
Industrial	10.29	39.82	57.95	27.34	98.75 **	0.69
	(1.14)	(24.51)	(1.56)	(0.99)	(19.30)	(0.17)
Utilities	12.92	16.60	-16.49	-55.51	20.66 **	-39.93 **
	(1.41)	(0.57)	(-0.42)	(-1.52)	(4.17)	(-8.59)
Transportation	14.33		128.94	110.02 **	68.80 **	12.16
	(1.39)		(1.88)	(3.64)	(5.94)	(1.47)
Government	7.18	28.77			14.93	25.68 *
	(0.31)	(0.52)			(0.38)	(2.20)
Other					163.47 **	69.91 **
					(5.83)	(3.42)
Rating		7.37 **		27.44 **		29.06 **
		(2.99)		(8.65)		(43.11)
Number of observations	1,029	39	439	364	10,543	8,686
Adjusted R^2	0.51	0.67	0.19	0.46	0.21	0.43
F	90.00	6.60	6.55	11.45	238.24	261.21

Table 5.4: Regression analyses of the determinants of credit spreads – the impact of credit risk.[360] [361]

Comparing the results presented in model [2c] with those presented in model [1c], important differences either in significance and size of the coefficients can be pointed out, namely:

1. The coefficients on log transaction size, U.K. borrowers, and industrial and transportation dummy variables become insignificant.

[360] This table presents the results of an ordinary least squares regression analysis of determinants of loan pricing credit spreads for the PF, AS, and CB high-information samples and the sub-samples created using the data available on rating. The *t*-statistics reported in parentheses are based on heteroskedasticity-consistent standard errors. ** and * indicate that the reported coefficient is statistically significant at the 1% and 5% level, respectively.

[361] The following variables were omitted because of collinearity: (i) *U.K. borrowers*, *volatility*, *commercial*, *transportation* and *other* in estimating model [2a]; and (ii) *log loan to value* and *risk free rate* in estimating model [2c]. *Government* and *other* dummy variables do not exist for AS transactions.

2. Currency risk and government dummy variable become significantly and positively related with credit spread (the predicted credit spread is approximately 25.68 bps higher for issuers belonging to government industry than in the financial institutions industry), while the slope of the Euro swap curve (EUSA5y-Libor3M) significantly reduces a CB issue credit spread.
3. The sign of the impact of the time to maturity on credit spread changes between regressions; i.e., in model [1c] maturity is significantly negative and becomes significantly positive in model [2c]. This effect can be explained by the reduction of the sample, as we do not have multicollinearity problems – the higher pair-wise correlation coefficient is 0.25 in absolute values between the maturity and utilities dummy variable. Thus, for CB issues with rating, a one-year increase in maturity is associated with a 1 bps increase in credit spread.
4. A change in coefficient sign also takes place for commercial and utilities dummy variables. This means that when controlling for rating, issuers belonging to the commercial and utilities industry pay lower credit spreads than issuers in the financial industry.[362]

For PF loans (model [2a]), the coefficient of the risk-free rate remains significantly and negatively related to credit spread. Coefficients on log transaction size, log loan to value, number of banks, country risk, currency risk, crisis, and EUSA5y-Libor3M become insignificant. Thus, the credit spread is basically explained by credit risk and level of interest rate, the last ones roughly reflecting the monetary policy. It is also important to notice that this change in coefficients is also related to the significant reduction in the number of observations between models [1a] and [2a] – from 1,029 to 39 observations –, which implies that significant precaution is needed in the analysis of the results for PF loans when we include the rating variable. Each of these regressions explains a non-trivial fraction of the total variation in observed PF loan spreads, yielding adjusted R^2 values of 0.51 and 0.67.

Results in estimating Model [2b] show that the number of banks and the slope of the Euro swap curve significantly reduce the credit spread. The coefficients on log loan to

[362] In model [2c] the predicted credit spread is approximately 17.93 bps and 39.93 bps lower for issuers belonging to the commercial and utilities industry, respectively, than in the financial institutions industry. It is important to notice that we do not have multicollinearity problems when running model [2c].

value and on crisis and commercial dummy variables become insignificant, while volatility and transportation dummy variable both are significantly and positively related to credit spread. Our findings are in line with empirical studies, which found credit ratings to be one of the most important determinants of AS bonds credit spread. The adjusted R^2 value increases form 0.19 in model [1b] to 0.46 in model [2b].

In short, the inclusion of a credit risk variable significantly increases the explanatory power of models for either SF and SDF transactions.

5.3.3.3. The Impact of Credit Accessibility on SF and SDF Credit Spreads

As referred in sub-section 5.3.2, variable credit accessibility tries to capture the effect of credit conditions on the cost of funding. Models [3a], [3b], and [3c] present loan pricing regression results for a sample of 763 PF loans, 171 AS bonds, and 6,139 CB with information on credit accessibility (measured by iTraxx Europe index) at the issue or active date. We compare these results with those obtained from the estimation of equation 5.1 using each of three high-information samples (models [1a], [1b], and [1c]).

While models [3a] and [3c] show, as expected, a significantly and positive relation between credit accessibility and credit spread, model [3b] shows that the coefficient of credit accessibility is insignificant for AS bonds. However, the impact of credit conditions on the credit spread differs in magnitude from PF loans to CB issues. A one unit increase in iTraxx Europe index is associated with an increase of 0.54 bps and 0.82 bps in PF and AS issue credit spreads, respectively.[363]

Models [3a], [3b], and [3c] yield adjusted R^2 values of 0.49, 0.24, and 0.53 for PF, AS, and CB issues, respectively. It is important to notice the significant increase in the adjusted R^2 for CB issues – from 0.21 in model [1c] to 0.53 in model [3c].

[363] Regarding CB issues, important differences either in significance and size of the coefficients – between model [1c] and model [3c] – can be pointed out, namely: (i) the coefficient on transportation dummy variable becomes insignificant; (ii) currency risk and government dummy variables become significantly and positively related with credit spread; (iii) the sign of the impact of time to maturity and transaction size on credit spread is significantly negative in model [1c] and becomes significantly positive in model [2c], i.e., when controlling for rating and credit accessibility, variables log transaction size and maturity are significantly and positively related to credit spread; and (iv) a change in coefficient sign also takes place for commercial, industrial, and utilities dummy variables, i.e., when controlling for rating and credit accessibility, issuers belonging to commercial, industrial and utilities industry pay lower credit spreads than issuers in the financial industry.

Dependent variable: Credit spread (bps)	[1a] All PF Loans	[3a] PF Loans with credit accessibility	[1b] All AS Bonds	[3b] AS Bonds with credit accessibility	[1c] All CB	[3c] CB with rating and credit accessibility
Independent variables:						
Intercept	257.66 **	242.39 **	113.44 *	275.34 **	81.57 **	-242.27 **
	(9.43)	(7.21)	(2.37)	(3.25)	(7.78)	(-24.47)
Log transaction size	-19.52 **	-21.62 **	-6.75	-10.95	-8.80 **	11.10 **
	(-4.93)	(-4.46)	(-1.52)	(-1.09)	(-6.43)	(9.56)
Log loan to value	4.37 *	7.35 **	-40.91 **	-47.65 **		
	(2.04)	(2.79)	(-5.48)	(-4.28)		
Maturity	0.51	0.25	-0.72	-0.34	-1.12 **	1.30 **
	(1.67)	(0.66)	(-1.52)	(-0.49)	(-3.87)	(5.62)
Number of tranches	-1.02	-3.62	-3.08	-18.25 **	19.62 **	28.39 **
	(-0.56)	(-1.53)	(-0.95)	(-3.08)	(36.87)	(9.46)
Number of banks	1.42 **	1.94 **	-9.36 **	-27.57 **	-1.63 **	-1.55 **
	(3.87)	(3.50)	(-2.58)	(-3.51)	(-3.47)	(-2.90)
Country risk	7.78 **	9.88 **	-12.80	-16.60	0.46	1.79
	(2.91)	(3.63)	(-1.04)	(-1.10)	(0.29)	(1.31)
Currency risk	38.11 **	48.39 **	16.95	129.28 **	3.01	8.96 *
	(2.88)	(2.65)	(0.79)	(2.93)	(0.60)	(2.04)
U.K. borrowers	49.85 **	58.30 **	10.39	-111.97 *	17.49 **	20.11 **
	(5.23)	(4.25)	(0.46)	(-2.43)	(3.41)	(4.17)
Crisis	174.01 **	154.60 **	121.25 *		77.41 **	37.39 **
	(16.26)	(8.07)	(2.43)		(15.43)	(4.88)
Risk free rate	-0.16 **	-0.12 *	0.12			
	(-4.46)	(-2.24)	(1.28)			
Volatility	0.49	-0.53	2.25 *	6.37 **	2.06 **	1.63 **
	(1.64)	(-1.26)	(2.13)	(3.59)	(9.91)	(5.80)
EUSA5y-Libor3M	-0.46 **	-0.40 **	-0.45 **	-0.56 **	-0.02	-0.05
	(-7.41)	(-4.31)	(-3.30)	(-3.34)	(-0.60)	(-1.39)
Commercial			101.80 **	131.04	102.44 **	-37.90 **
			(3.28)	(1.95)	(17.20)	(-6.36)
Industrial	10.29	12.87	57.95	0.07	98.75 **	-12.07 *
	(1.14)	(1.08)	(1.56)	(0.00)	(19.30)	(-2.24)
Utilities	12.92	13.71	-16.49	30.30	20.66 **	-61.72 **
	(1.41)	(1.20)	(-0.42)	(0.40)	(4.17)	(-11.13)
Transportation	14.33	19.55	128.94		68.80 **	-0.60
	(1.39)	(1.37)	(1.88)		(5.94)	(-0.06)
Government	7.18	14.38			14.93	36.64 *
	(0.31)	(0.57)			(0.38)	(2.33)
Other					163.47 **	74.13 **
					(5.83)	(3.06)
Rating						30.80 **
						(38.84)
Credit accessibility		0.54 **		-0.66		0.82 **
		(3.39)		(-1.02)		(10.27)
Number of observations	1,029	763	439	171	10,543	6,139
Adjusted R^2	0.51	0.49	0.19	0.24	0.21	0.53
F	90.00	77.32	6.55	6.03	238.24	232.48

Table 5.5: Regression analyses of the determinants of credit spreads – the impact of credit accessibility.[364] [365]

[364] This table presents the results of an ordinary least squares regression analysis of determinants of loan pricing credit spreads for the PF, AS, and CB high-information samples and the sub-samples created using the data available on credit accessibility. The *t*-statistics reported in parentheses are based on heteroskedasticity-consistent standard errors. **, * indicate that the reported coefficient is statistically significant at the 1% and 5% level, respectively.

[365] The following variables were omitted because of collinearity: (i) *commercial* and *other* dummy variables in estimating model [3a]; (ii) *crisis, risk free* rate and *transportation* dummy variable in estimating model [3b]; and (iii) *log loan to value* and *risk free rate* in estimating model [3c]. Rating variable was included in estimating model [3c] because the lost in observations is not significant. *Government* and *other* dummy variables do not exist for AS transactions.

5.3.3.4. The Impact of Fees on SF and SDF Credit Spreads

Credit spreads are not the only measure of risk premium, because loans and bonds also carry fees that can be related to creditworthiness and performance. In the syndication market (PF loans) two types of fees are usually charged by lenders: (i) commitment or annual fees and paid on an annual basis on the balance of the undrawn portion of a loan; and (ii) participation or upfront fees, which are paid upfront to banks participating in a syndicate. In the bond market a type of fee is usually charged by underwriters: management fees, which are paid annually on the balance of the undrawn (if any) portion of the bond. Thus, we use the following two variables to capture the impact of fees on SF and SDF credit spreads: (i) management fee (management fees for AS and CB issues and commitment or annual fees for PF loans); and (ii) upfront fees (only available for PF loans). Unfortunately, data on fees were not available for all of the observations in our high-information samples. Data on management fees were available for 125, 439, and 10,543 tranches for PF, AS, and CB issues, respectively. Data on upfront fees were available for 199 PF loans.

Models [4a], [4b], and [4c] of Table 5.6 present the results of our loan and bond pricing regressions for three sub-samples of 125, 37, and 1,334 PF, AS, and CB issues, respectively. These regressions examine whether loans and bonds credit spread and fees are complements or substitutes. For PF and CB issues, the coefficients on the management fee variable are significantly positive, suggesting that fees and spreads are complements. On average, each additional basis point increase in the management fee increases the credit spread by 0.85 bps and 0.51 bps for PF and CB issues, respectively. The logical interpretation of this finding for PF loans is that banks are enticed to participate in riskier loans by being offered both higher fees and higher spreads. Regarding CB transactions, banks increase their effort to underwrite riskier securities if the management fee they receive over the life of the transaction increases. Not surprisingly, including management fees in the regressions also significantly reduces the regression intercept, although it remains positive in both cases. Additionally, the model for PF loans (model [4a]) also has by far the highest explanatory power (adjusted R^2 value of 0.70) on any of the estimations presented in Tables 5.3, 5.4, 5.5, and 5.6.

Dependent variable: Credit spread (bps)	[1a] All PF Loans	[4a] PF Loans with management fee	[1b] All AS Bonds	[4b] AS Bonds with management fee	[1c] All CB	[4c] CB with management fee
Independent variables:						
Intercept	257.66 **	123.38 **	113.44 *	-257.06	81.57 **	10.45
	(9.43)	(3.60)	(2.37)	(-0.91)	(7.78)	(0.59)
Log transaction size	-19.52 **	-13.00	-6.75	49.66	-8.80 **	-11.17 **
	(-4.93)	(-1.97)	(-1.52)	(1.18)	(-6.43)	(-4.67)
Log loan to value	4.37 *	1.33	-40.91 **	39.33		
	(2.04)	(0.27)	(-5.48)	(1.72)		
Maturity	0.51	0.75	-0.72	0.84	-1.12 **	3.63 **
	(1.67)	(0.99)	(-1.52)	(0.30)	(-3.87)	(7.42)
Number of tranches	-1.02	12.02 **	-3.08	-6.37	19.62 **	10.07
	(-0.56)	(2.88)	(-0.95)	(-0.60)	(36.87)	(1.87)
Number of banks	1.42 **	1.15	-9.36 **	-16.55	-1.63 **	1.53 **
	(3.87)	(1.32)	(-2.58)	(-1.95)	(-3.47)	(3.32)
Country risk	7.78 **	-7.21	-12.80		0.46	10.40 **
	(2.91)	(-1.93)	(-1.04)		(0.29)	(5.39)
Currency risk	38.11 **	5.02	16.95	109.20	3.01	21.81 **
	(2.88)	(0.21)	(0.79)	(1.83)	(0.60)	(4.44)
U.K. borrowers	49.85 **	19.71	10.39		17.49 **	-2.37
	(5.23)	(1.02)	(0.46)		(3.41)	(-0.38)
Crisis	174.01 **	177.94 **	121.25 *		77.41 **	127.29 **
	(16.26)	(8.48)	(2.43)		(15.43)	(8.29)
Risk free rate	-0.16 **		0.12			
	(-4.46)		(1.28)			
Volatility	0.49		2.25 *		2.06 **	1.86 **
	(1.64)		(2.13)		(9.91)	(5.25)
EUSA5y-Libor3M	-0.46 **	-0.24 *	-0.45 **	0.11	-0.02	-0.09 **
	(-7.41)	(-2.54)	(-3.30)	(0.22)	(-0.60)	(-2.98)
Commercial			101.80 **	248.55 **	102.44 **	70.56 **
			(3.28)	(2.84)	(17.20)	(8.81)
Industrial	10.29	12.55	57.95	-130.38	98.75 **	56.23 **
	(1.14)	(0.82)	(1.56)	(-1.79)	(19.30)	(10.05)
Utilities	12.92	6.96	-16.49	-10.24	20.66 **	2.58
	(1.41)	(0.41)	(-0.42)	(-0.17)	(4.17)	(0.27)
Transportation	14.33	-13.58	128.94	-71.68	68.80 **	16.65
	(1.39)	(-0.75)	(1.88)	(-0.60)	(5.94)	(0.67)
Government	7.18	-5.82			14.93	
	(0.31)	(-0.09)			(0.38)	
Other					163.47 **	121.17 **
					(5.83)	(3.37)
Management fee		0.85 **		1.84		0.51 **
		(3.17)		(1.35)		(2.74)
Number of observations	1,029	125	439	37	10,543	1,334
Adjusted R^2	0.51	0.70	0.19	0.37	0.21	0.40
F	90.00	18.56	6.55	2.75	238.24	32.82

Table 5.6: Regression analyses of the determinants of credit spreads – the impact of management fee.[366] [367]

The coefficient of the management fee is insignificant for AS transactions. This makes sense because in an AS transaction (i) banks are usually the originator; i.e., banks sell the assets to a separate entity (SPV), which then issues securities; and (ii) the originator

[366] This table presents the results of an ordinary least squares regression analysis of the determinants of loan pricing credit spreads for the PF, AS, and CB high-information samples and the sub-samples created using the data available on management fee. The *t*-statistics reported in parentheses are based on heteroskedasticity-consistent standard errors. **, * indicate that the reported coefficient is statistically significant at the 1% and 5% level, respectively.

[367] The following variables were omitted because of collinearity: (i) *risk free* rate, *volatility* and *commercial* and *other* dummy variables in estimating model [4a]; (ii) *country risk*, *U.K.* borrowers, *crisis*, *risk free rate*, and *volatility* in estimating model [4b]; and (iii) *log loan to value*, *risk free rate*, and *government* dummy variable in estimating model [4c]. *Government* and *other* dummy variables do not exist for AS transactions.

retains the servicing function and thus receives the servicing fee. With the exception of the commercial dummy variable, all of the other variables in AS bonds management fee regression are insignificant. However, the results have to be analyzed carefully as we verify a significant reduction in the number of observations between models [1b] and [4b] – from 439 to 37 observations.

Only two variables in the PF loans management fee sample model remain significantly related with credit spread (model [1a] *versus* model [4a]). As it has frequently been the case, dummy variable crisis is significantly, positively related to credit spread. The coefficient of this variable indicates that the PF loans credit spread is 177.94 bps higher during the crisis period over the pre-crisis period. Moreover, the slope of the Euro swap curve (EUSA5y-Libor3M) significantly reduces a PF loan credit spread. The coefficient of the number of tranches, however, is significantly, positively related to spread, although the coefficient of this variable indicates that increasing the number of tranches by 1 unit will increase the spread of PF loans by an average of 12.02 bps.

In CB issues management fee model (model [4c]), the variables' log transaction size, crisis, volatility, and commercial, industrial and other dummy variables remain statistically significant in explaining the credit spread. The coefficient of the number of tranches and U.K. borrowers, utilities and transportation dummy variables become insignificant (when compared with the results presented in regression [1c]), while the coefficients of the country risk, currency risk (both with a positive sign), and EUSA5y-Libor3M (with a negative sign) become statistically significant. As usual, the coefficient of the time to maturity changes its sign; i.e., when controlling for management fees, maturity significantly increases the CB issues credit spread. Finally, the coefficient of the number of banks becomes significantly, positively related to credit spread. The coefficient of this variable indicates that, increasing the number of banks by 1 unit will increase the spread of CB issues by an average of 1.53 bps.

The upfront fee is a fee paid by a borrower to a bank syndicate for syndicating a loan in a PF transaction. Credit spreads and fees are usually complements or substitutes in syndicated loans; i.e., arrangers are usually 'paid' by spreads and fees. Model [5a] in

Table 5.7 presents loan pricing regression results for a sample of 196 PF loans with information on upfront fee. We also include Models [1a] and [4a] for comparison.

Dependent variable: Credit spread (bps)	[1a] All PF Loans		[4a] PF Loans with management fee		[5a] PF Loans with upfront fee	
Independent variables:						
Intercept	257.66	**	123.38	**	89.13	**
	(9.43)		(3.60)		(3.18)	
Log transaction size	-19.52	**	-13.00		0.30	
	(-4.93)		(-1.97)		(0.06)	
Log loan to value	4.37	*	1.33		-0.08	
	(2.04)		(0.27)		(-0.02)	
Maturity	0.51		0.75		0.83	
	(1.67)		(0.99)		(1.77)	
Number of tranches	-1.02		12.02	**	2.08	
	(-0.56)		(2.88)		(0.68)	
Number of banks	1.42	**	1.15		-0.98	*
	(3.87)		(1.32)		(-2.05)	
Country risk	7.78	**	-7.21		2.89	
	(2.91)		(-1.93)		(0.91)	
Currency risk	38.11	**	5.02		-6.78	
	(2.88)		(0.21)		(-0.59)	
U.K. borrowers	49.85	**	19.71		39.27	**
	(5.23)		(1.02)		(3.92)	
Crisis	174.01	**	177.94	**	131.57	**
	(16.26)		(8.48)		(7.10)	
Risk free rate	-0.16	**				
	(-4.46)					
Volatility	0.49					
	(1.64)					
EUSA5y-Libor3M	-0.46	**	-0.24	*	-0.33	**
	(-7.41)		(-2.54)		(-5.43)	
Commercial						
Industrial	10.29		12.55		6.79	
	(1.14)		(0.82)		(0.38)	
Utilities	12.92		6.96		-1.91	
	(1.41)		(0.41)		(-0.11)	
Transportation	14.33		-13.58		-32.99	
	(1.39)		(-0.75)		(-1.68)	
Government	7.18		-5.82		-22.53	
	(0.31)		(-0.09)		(-0.90)	
Other						
Management fee			0.85	**		
			(3.17)			
Upfront fee					0.74	**
					(8.57)	
Number of observations	1,029		125		196	
Adjusted R^2	0.51		0.70		0.66	
F	90.00		18.56		25.76	

Table 5.7: Regression analyses of the determinants of credit spreads – the impact of upfront fee on PF loan credit spreads.[368] [369]

[368] This table presents the results of an ordinary least squares regression analysis of the determinants of loan pricing credit spreads for the PF high-information sample and two sub-samples created using the data available on management fee and upfront fee. The *t*-statistics reported in parentheses are based on heteroskedasticity-consistent standard errors. **, * indicate that the reported coefficient is statistically significant at the 1% and 5% level, respectively.

[369] The following variables were omitted because of collinearity in estimating model [5a]: *risk free* rate, *volatility* and *commercial* and *other* dummy variables.

It is worth noting that for PF loans both management fee and upfront fees are very significantly and positively correlated with credit spreads, which supports the idea that risk is priced jointly through spreads and fees. Again, model [5a] has a relatively significant explanatory power, yielding an adjusted R^2 value of 0.66.

These findings are consistent to those presented by Blanc-Brude and Strange (2007) – for PPPs in the European Union and the United Kingdom – and by Gatti et al. (2007), who find that top arrangers are paid by higher fees even if the overall cost of the loan tranche is reduced by certification.

5.3.3.5. The Impact of Bonds' Specific Variables on Credit Spreads

There are specific variables that can only be included in regression models for bond credit spreads. Collateral is a dummy variable taking the value of 1 if securities are MBS and 0 otherwise; i.e., collateral is available only for AS bonds. Similarly, callable and fixed rate are variables available only for AS and CB issues. Thus, these variables cannot be included in the model for PF loans since they are only meaningful in the context of bond issues. Models [6b] and [7c] in Table 5.8 present loan pricing regression results for a sample of 364 and 6,139 AS and CB issues, respectively.

As expected, we find a significantly negative coefficient for the collateral dummy variable. This means that MBS (i.e., securities backed by mortgages) have an average credit spread lower than ABS (i.e., securities backed by consumer-backed products) by 47.37 bps. One interpretation is that the collateral of MBS is less diverse and subject to less price volatility than the collateral of ABS. Additionally, the existence of a mortgage reduces the expected loss in a scenario of default.

Although insignificant for AS bond issues, fixed rate and callable dummy variables have a strong positive relationship with credit spreads for CB issues. Regarding the fixed rate dummy variable, the result for CB issues can clearly be explained since the coupon rates on these bonds do not fluctuate and are typically protected to avoid the risk of rising interest rates. This indicates that CB borrowers on average have to pay an extra risk premium through fixed price issues in comparison with floating price issues by

29.24 bps. The insignificant relationship for AS bonds may be explained by the fact that AS securities are especially attractive for fixed-income investors who want to diversify high-yield bonds without any interest sensitivity. The introduction of a call option in a CB issue increases the credit spread by 50.68 bps. Thus, an issuer has to pay a premium to have the right to redeem the bond before the bond maturity.

With regard to model [6b], the results are in line with the expected coefficient signs for all the variables that significantly affect AS bond credit spreads; i.e., the volatility, rating and transportation dummy variable are significantly and positively related with credit spread, while the slope of the Euro swap curve and collateral dummy variable significantly reduce AS bond credit spreads. Fifteen variables in the CB sub-sample model remain significantly related with credit spread (model [7c]). While variables' log transaction size, number of tranches, volatility, rating, credit accessibility, and U.K. borrowers, crisis, fixed rate, callable, government and other dummy variables are significantly, positively related to credit spread, the number of banks and commercial, industrial and utilities dummy variables significantly reduces a CB issue credit spread.

Models [6b] and [7c] have, by far, the highest explanatory power, yielding an adjusted R^2 value of 0.48 and 0.55 for AS and CB issues, respectively.

Dependent variable: Credit spread (bps)	[6b] AS with rating, collateral, fixed rate and callable	[7c] CB with rating, credit accessibility, fixed rate and callable
Independent variables:		
Intercept	22.34 (0.60)	-254.90 ** (-24.60)
Log transaction size	2.76 (0.71)	13.34 ** (11.45)
Maturity	0.16 (0.26)	0.26 (0.97)
Number of tranches	1.37 (0.49)	25.87 ** (8.53)
Number of banks	-4.51 (-1.17)	-2.05 ** (-3.80)
Country risk	-8.06 (-1.21)	2.33 (1.71)
Currency risk	27.21 (1.50)	1.25 (0.29)
U.K. borrowers	-9.61 (-0.48)	21.08 ** (4.45)
Crisis	31.82 (0.88)	33.85 ** (4.38)
Volatility	2.73 ** (3.51)	1.53 ** (5.50)
EUSA5y-Libor3M	-0.50 ** (-4.42)	-0.05 (-1.53)
Commercial	19.12 (0.69)	-47.60 ** (-7.72)
Industrial	26.61 (0.89)	-24.22 ** (-4.33)
Utilities	-65.45 (-1.72)	-64.43 ** (-10.78)
Transportation	103.77 ** (3.03)	-9.19 (-0.90)
Government		49.16 * (2.30)
Other		52.66 * (2.28)
Rating	27.24 ** (10.42)	29.19 ** (37.00)
Credit accessibility		0.83 ** (10.27)
Collateral	-47.37 ** (-2.68)	
Fixed rate	-26.93 (-1.13)	29.24 ** (8.79)
Callable	-15.89 (-1.08)	50.68 ** (9.54)
Number of observations	364	6,139
Adjusted R^2	0.48	0.55
F	11.57	223.82

Table 5.8: Regression analyses of the determinants of credit spreads – the impact of collateral, fixed rate and callable on AS and CB issues credit spread.[370] [371]

[370] This table presents the results of an ordinary least squares regression analysis of the determinants of loan pricing credit spreads for AS and CB sub-samples created using the data available on collateral for AS transactions and on fixed rate and callable for both AS and CB issues. The *t*-statistics reported in parentheses are based on heteroskedasticity-consistent standard errors. **, * indicate that the reported coefficient is statistically significant at the 1% and 5% level, respectively.

[371] Variables *risk free rate* and *log loan to value* were omitted because of collinearity in estimating model [7c]. These variables were also omitted in estimating regression [6b] because they are not relevant in explaining AS bonds credit spread.

5.3.4. The Impact of the Financial Crisis on SF and SDF Credit Spreads

In order to test the impact of the 2007/2008 financial crisis and the subsequent European sovereign debt crisis on SF credit spreads, we hypothesize (Hypothesis 4) that after controlling for macroeconomic conditions and loan characteristics, the financial crisis does not have a significant impact on SF credit spreads. In sub-section 4.4.4 we reject hypothesis 4 since the average credit spread is statistically and significantly higher for PF loans (329.1 bps *versus* 136.9 bps), AS bonds (206.5 bps *versus* 143.5 bps), and CB (220.3 bps *versus* 125.5) during the crisis period. However, in this analysis we do not control for other microeconomic and macroeconomic pricing factors. Based on the regression analysis presented in the previous sub-sections, where we take these factors directly into account, we also reject hypothesis 4, as the coefficient for the crisis dummy variable is significantly, positively related to credit spread. Only in models [2b] and [6b] for AS transactions we find an insignificant relationship between the crisis dummy variable and credit spread. This insignificant relationship can be explained by the fact that our sub-sample for AS issues in the crisis period is relatively smaller (38 observations) compared to the pre-crisis period (401 observations).

Our purpose is to understand if the 2007/2008 financial crisis and the subsequent European sovereign debt crisis significantly influenced the explanatory power of the regressions, as well as the coefficients on the macro and micro pricing factors (in sign and in significance). We are therefore examining whether our results are robust over time by considering a pre-crisis period from January 1^{st}, 2000 and September 14^{th}, 2008, and a crisis period from September 15^{th}, 2008 through to December 31^{st}, 2011. The results are presented in Table 5.9.

Model [1a] for both pre-crisis and crisis period shows exactly the results expected; i.e., PF loans credit spread has increased significantly during the crisis period. The split of our PF loans sample has a considerable impact on the regressions intercept, causing an increase of 342.96 bps between pre-crisis and crisis sub-samples.

Dependent variable: Credit spread (bps)	[1a] All PF Loans | pre-crisis period	[1a] All PF Loans | crisis period	[2b] AS Bonds with rating | pre-crisis period	[2b] AS Bonds with rating | crisis period	[2c] CB with rating | pre-crisis period	[2c] CB with rating | crisis period
Independent variables:						
Intercept	203.26 **	546.22 **	-6.98	609.12	-27.04 *	-249.28 **
	(6.96)	(11.44)	(-0.17)	(1.83)	(-2.25)	(-13.30)
Log transaction size	-15.34 **	-21.36 **	3.98	-30.11	-15.10 **	28.30 **
	(-3.35)	(-2.75)	(0.91)	(-0.83)	(-8.87)	(17.11)
Log loan to value	2.03	10.98 *	1.91	-18.31		
	(0.92)	(2.50)	(0.16)	(-0.60)		
Maturity	1.05 **	-0.74	-0.48	4.85	0.92 **	1.17 **
	(2.97)	(-1.12)	(-0.88)	(1.77)	(3.35)	(3.34)
Number of tranches	1.35	-2.44	2.86	-141.20	32.37 **	-12.11 **
	(0.62)	(-0.62)	(1.00)	(-1.81)	(10.72)	(-3.13)
Number of banks	1.44 **	0.86	-9.46 *	-1.06	-2.11 **	-1.27
	(3.99)	(0.75)	(-2.35)	(-0.02)	(-5.50)	(-1.70)
Country risk	1.71	12.91 **	-0.77	-39.16	-14.34 **	8.93 **
	(0.94)	(2.70)	(-0.11)	(-1.49)	(-13.59)	(4.72)
Currency risk	30.31 *	52.83	29.44	-164.36	38.03 **	12.95 *
	(2.44)	(1.49)	(1.64)	(-0.73)	(7.66)	(2.12)
U.K. borrowers	36.27 **	60.90 **	-3.81	-165.67	-14.40 **	32.45 **
	(4.15)	(2.78)	(-0.20)	(-1.10)	(-2.98)	(4.87)
Risk free rate	-0.14 **	-0.71 **	-0.01	1.18		
	(-3.51)	(-4.36)	(-0.03)	(1.39)		
Volatility	1.91 *	-0.25	1.73		3.74 **	3.37 **
	(2.27)	(-0.48)	(1.83)		(14.30)	(11.74)
EUSA5y-Libor3M	-0.46 **	-0.87 **	-0.38 **		-0.25 **	-0.08
	(-5.59)	(-5.20)	(-2.62)		(-8.86)	(-1.49)
Commercial			14.47		-1.83	-50.80 **
			(0.60)		(-0.36)	(-5.71)
Industrial	0.48	48.82 *	18.97		4.52	-26.63 **
	(0.05)	(2.46)	(0.71)		(1.08)	(-3.31)
Utilities	4.42	38.26 **	-58.21 **		-28.20 **	-72.31 **
	(0.37)	(2.80)	(-1.55)		(-4.83)	(-9.45)
Transportation	1.16	38.71	98.98 **		15.96	-17.28
	(0.10)	(1.36)	(3.98)		(1.64)	(-1.37)
Government	-5.11	68.99			23.58 *	
	(-0.18)	(1.96)			(2.03)	
Other					53.26 **	41.27
					(6.77)	(1.20)
Rating			30.38 **	-1.93	25.61 **	38.02 **
			(10.05)	(-0.22)	(29.30)	(36.57)
Number of observations	702	327	334	30	5,594	3,092
Adjusted R^2	0.11	0.27	0.52	0.23	0.35	0.53
F	8.49	7.77	15.38	1.87	155.09	145.10

Table 5.9: Regression analyses of the determinants of credit spreads – the impact of the financial crisis.[372] [373]

The coefficients of the log transaction size, risk free rate and EUSA5y-Libor3M remain (when comparing regression results for pre-crisis and crisis sub-samples) significantly,

[372] This table presents the results of an ordinary least squares regression analysis of determinants of loan pricing credit spreads for the PF, AS, and CB sub-samples created by considering a pre-crisis period from January 1st, 2000 through September 14th, 2008, and a crisis period from September 15th, 2008 through December 31st, 2011. The *t*-statistics reported in parentheses are based on heteroskedasticity-consistent standard errors. **, * indicate that the reported coefficient is statistically significant at the 1% and 5% level, respectively.

[373] The following variables were omitted because of collinearity: (i) *commercial* and *other* dummy variables in estimating model [1a], either in pre-crisis period and crisis period; (ii) *volatility* and *EUSA5y-Libor3M* and all *sector* dummy variables in estimating model [2b] for the crisis period; and (iii) *log loan to value* and *risk free rate* for both periods and *government dummy variable* for crisis period in estimating model [2c]. The rating variable was omitted because it would cause a significant reduction in the number of observations in estimating model [1a] (36 and 3 observations for the pre-crisis and the crisis period, respectively).

negatively related to credit spread. Similarly, coefficient of the U.K. borrowers remains significantly, positively related to credit spread. It is important to notice that all the referred coefficients increased their values. Coefficient of maturity, number of banks, currency risk and volatility become insignificant. Finally, variables' log loan to value, country risk and industrial and utilities dummy variables become significantly, positively related to credit spread. Thus, we can identify a change in the type of factors that explain PF loan credit spreads, from marketability factors (maturity and number of banks) to default factors (loan to value and country risk). The statistical significance of log loan to value might be explained by the fact that a higher loan to value ratio means greater risk for lenders since that loan constitutes a larger share in their loan portfolio. Additionally, during the crisis period banks lost balance sheet capacity to lend (huge losses in assets lead to questions regarding bank solvency). The significant and positive relationship between country risk and credit spread during the crisis period is not a surprise, since rating agencies downgraded sovereign bond ratings from several Western European countries (e.g., Belgium, Greece, Ireland, Italy, Portugal, and Spain).

For AS bonds (model [2b] for pre-crisis and crisis sub-samples), none of the coefficients are statistically significant for the crisis period. This can be explained by the significant reduction in the number of observations of model [2b] for pre-crisis period *vis-a-vis* model [2b] for crisis period – from 334 to 30 observations. Unfortunately, the small number of observations for AS transactions during the crisis period does not allow for an in-depth analysis. We believe that this result presents an important opportunity for future research.

With respect to SDF (CB) issues (model [2c]), the coefficients of maturity, currency risk, volatility, utilities dummy variable, and rating remain statistically significant, while the coefficients of the number of banks, EUSA5y-Libor3M, and other dummy variables become insignificant. On the contrary, commercial and industrial dummy variables become significantly, negatively related with credit spread, which means that during the crisis period issuers in the financial institution sector pay higher credit spreads than in commercial and industrial sectors – the predicted credit spread is approximately 50.80 bps and 26.63 bps lower for issuers belonging to commercial and industrial sectors, respectively, than in the financial sector.

A change in coefficient signs takes place for four variables. As for PF loans, variables of U.K. borrowers and country risk are significantly and positively related to CB issues credit spread during the crisis period. Log transaction size variable becomes significantly, positively related to credit spread while the number of tranches become significantly, negatively related to credit spread – comparing the pre-crisis with the crisis period. The change in sign for transaction size and number of tranches could be explained by a liquidity shortfall in financial markets. The critical phase of the 2007/2008 financial crisis manifested a shortage of liquidity, which was reflected in a fall in asset prices below their long run fundamental price and a deterioration in external financing conditions. U.K. borrowers' dummy variable becomes significantly, positively related to CB issue credit spread during the crisis period because the resulting liquidity problems (funding liquidity and balance sheet liquidity) vehemently affected U.K. financial institutions, which issued almost 50% of all CB issued in the U.K.

Based on our regression analysis, we again reject hypothesis 4, as the 2007/2008 financial crisis and the subsequent European sovereign debt crisis does have a significant impact on PF loans credit spread. The same finding is obtained for CB issues. Thus, the financial crisis substantially influences the explanatory power of the regressions, as well as the coefficients of the macro and micro pricing factors (in sign and in significance) both for SF and SDF transactions.

5.3.5. The Term Structure of SF Transactions

In contrast to SDF, for which credit spreads are a positive linear function of maturity, the term structure of PF loans is somewhat an empirical puzzle. For example, Sorge and Gadanecz (2008) detect that whereas credit spreads for both investment-grade and speculative-grade bonds, other than for project finance, are a positive linear function of maturity, in PF loans the term structure of credit spreads is 'hump-shaped'. Even for CB, the empirical literature has been controversial regarding the term structure of credit spreads for non-investment grade bonds (see section 5.2). Regarding AS, empirical research [e.g., Vink and Thibeault (2008)] find an insignificant (for ABS) or significant negative relationship (for MBS and CDOs) between spread and maturity.

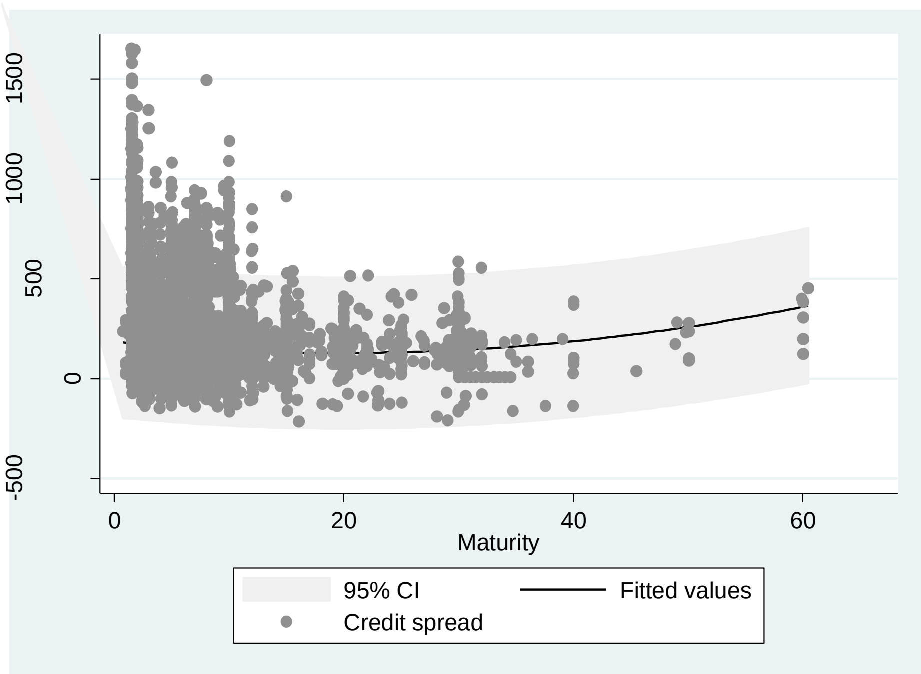
Given the controversy on the term structure of credit spreads for speculative-grade issuers, a recent strand of the CB literature has emphasized the importance of constructing homogeneous samples of bonds when studying the term structure of credit spreads [see, among others, Helwege and Turner (1999) and He et al. (2000)].[374] This means that when attempting to establish a relationship between credit spread and maturity using a heterogeneous sample of bonds, it is important to control for the different risk characteristics of individual issues (other than maturity), otherwise the analyzes might lead to misleading results. This sub-section will therefore take a multivariate regression approach, attempting to analyze the relationship between credit spread and maturity, controlling for other relevant micro and macro risk factors that affect credit spread. Our purpose it to understand the economics underlying the term structure of credit spreads, as derived from a large cross-section of Western European SF and SDF loans and bonds.

As presented in sub-section 4.3.3, time to maturity differs significantly between PF, AS, and CB issues at the 5% significance level. An AS tranche of average size matures just over 20.9 years, which is a long period if we compare this with the average 13.6 and 5.3 years for PF and CB tranches, respectively. SF transactions are thus characterized by much longer maturities compared to other forms of financing. This raises the following question: *are longer maturities perceived by lenders as a risk per se?* Answering this question is crucial to understand the peculiar nature of credit risk in SF; i.e., given the characteristics of SF transactions discussed in Chapter 4, *should we expect the term structure of credit spreads for SF issues to behave differently from that of SDF issues?*

Based on presented regression results for SF and SDF issues, a linear positive relationship between credit spread and maturity appears strongly significant for SDF transactions (CB issues) – see models [2c], [3c], and [4c] in Annex 8 –, in line with the intuition that lenders should get a higher remuneration for being exposed to risk for a longer period of time, and insignificant for SF transactions (PF loans and AS bonds) – see models [1a], [2a], [3a], [4a], [5a], [1b], [2b], [3b], [4b], and [6b] in Annex 8. Thus, our main conclusion so far is that, when controlled for other micro and macro risk factors, a linear positive relationship between spread and maturity shows up as very

[374] Helwege and Turner (1999) and He et al. (2000) argue that the findings in many studies reflect a sample selection bias due to better-quality speculative grade issuers tending to issue longer-term bonds.

significant for SDF transactions. This is demonstrated in Graph 1, which plots credit spread against maturity, it plots the prediction from a quadratic regression and adds the confidence interval on the basis of the standard error of forecast.



Graph 1: Credit spread *versus* maturity with confidence bands: CB.

As with other confidence intervals and hypothesis tests in an OLS regression, the standard errors and bands described depend on the assumption of independent and identically distributed errors. Hence, next we present the augmented component-plus-residual plot after adjusting for heteroskedasticity using the methodology proposed by Huber (1967) and White (1980). Based on model [2c], the augmented component-plus-residual plot shown in Graph 2, depict the partial relationship between bond credit spreads and maturity, once all other micro and macro factors have been controlled for.[375] Our results are similar to those presented by Sorge and Gadanecz (2008) for Bonds.

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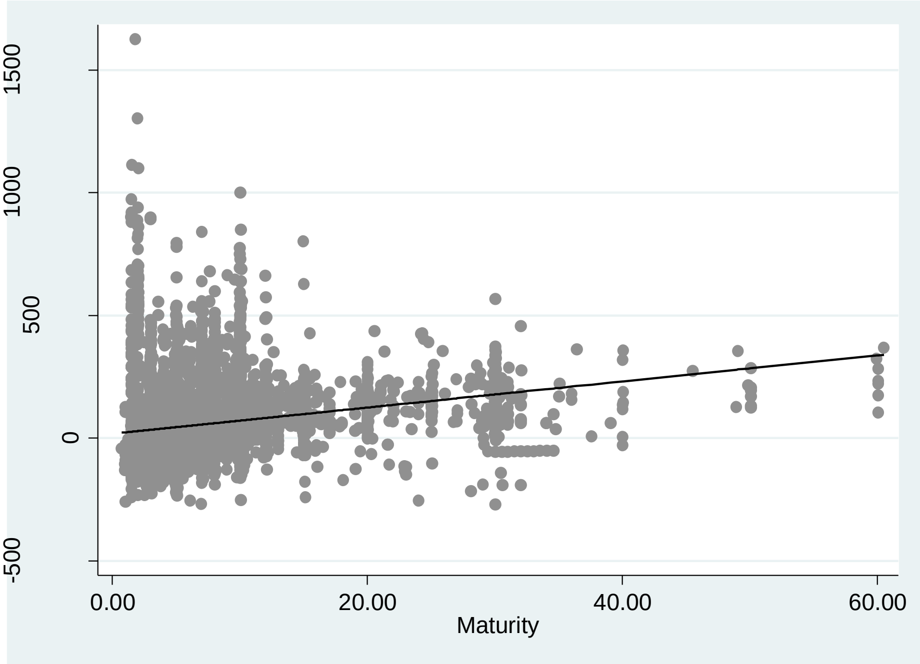
[375] The augmented component-plus-residual plot [Mallows (1986)] are diagnostic tools which for variable *x1* graphs each observation's residual plus its component predicted from *x1*, $e_i+b_1x1_i$. According to Hamilton (2006), '*... such plots might help diagnose nonlinearities and suggest alternative functional forms.*' For more details see Baum (2006) and Hamilton (2006).



Graph 2: Term structure of CB credit spreads.

Using these results as benchmarks, we now turn our attention to analyzing the term structure of credit spreads for SF transactions. Controlling for a set of other micro and macroeconomic factors, we find no significant linear relationship between credit spread and maturity for PF loans and AS bonds. Kleimeier and Megginson (2000) find that, ceteris paribus, longer-maturity PF loans appear to be associated with lower spreads. Sorge and Gadanecz (2008) begin with this finding, characterized by the authors as ‘surprising’, and verify the hypothesis of a hump-shaped term structure of credit spreads for PF loans. Regarding AS, Vink and Thibeault (2008) only find a significant negative relationship between spread and CDOs with a maturity lower than 5 years and between spread and MBS with a maturity longer than 15 years – coefficients on ABS are insignificant.

The empirical results reported lead us to verify the hypothesis of a hump-shaped term structure of credit spreads for PF loans and a negative relationship for AS bonds. We therefore augment our baseline multiple regression (equation 5.1) with non-linear maturity components. Table 5.10 reports regression results where the natural logarithm of maturity is included as an additional regressor in the models to test for the presence of any non-linear effects of maturity on credit spread form for SDF and SF samples.[376] The results show that both the explanatory power of regressions, as well as the coefficients on the macro and micro pricing factors (in sign and in significance) are largely the same for AS and CB issues (models [8b] and [8c]), as in the original specifications. However, considering PF loans, the explanatory power (adjusted R^2) increases significantly between models [1a] and [8a] – from 0.51 to 0.63.

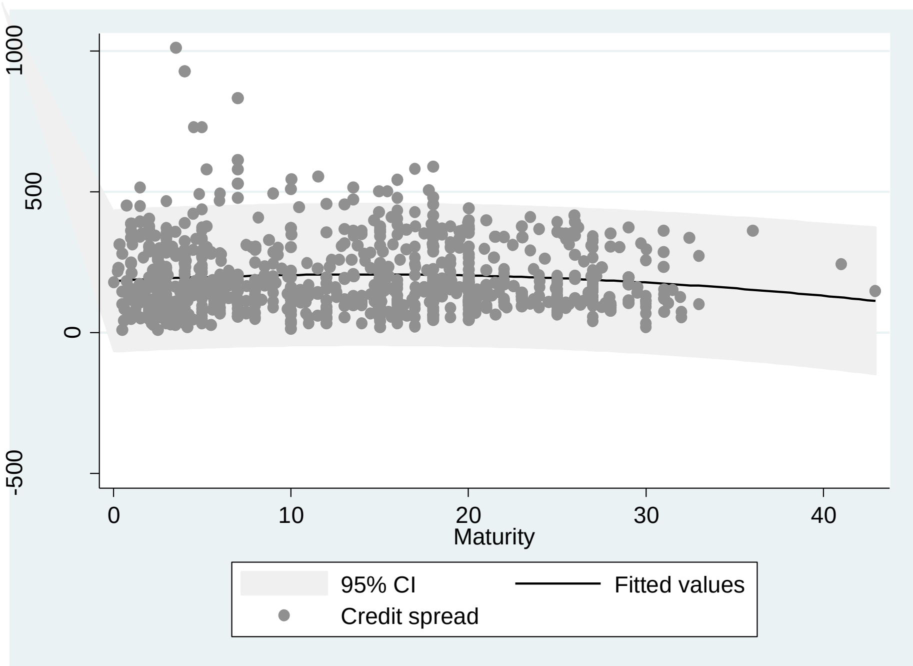
Dependent variable: Credit spread (bps)	[1a] All PF Loans	[8a] All PF Loans with log maturity	[2b] AS Bonds with rating	[8b] AS Bonds with rating and log maturity	[2c] CB with rating	[8c] CB with rating and log maturity
Independent variables:						
Intercept	257.66 ** (9.43)	228.31 ** (9.69)	13.27 (0.31)	34.71 (0.69)	-139.35 ** (-14.39)	-127.95 ** (-10.33)
Maturity	0.51 (1.67)	-1.72 ** (-2.60)	-0.36 (-0.67)	0.23 (0.23)	1.00 ** (4.60)	2.04 ** (4.68)
Log Maturity		21.47 ** (3.54)		-13.55 (-0.83)		-11.04 * (-2.22)
Log transaction size	-19.52 ** (-4.93)	-17.53 ** (-5.12)	3.74 (0.92)	4.11 (1.01)	0.75 (0.58)	0.67 (0.52)
Log loan to value	4.37 * (2.04)	2.57 (1.27)	0.79 (0.10)	0.89 (0.12)		
Number of tranches	-1.02 (-0.56)	-1.19 (-0.68)	2.39 (0.86)	2.83 (1.05)	23.97 ** (9.10)	23.57 ** (9.12)
Number of banks	1.42 ** (3.87)	1.22 ** (3.32)	-8.24 * (-2.10)	-8.21 * (-2.10)	-1.65 ** (-4.35)	-1.55 ** (-4.09)
Country risk	7.78 ** (2.91)	8.32 ** (3.35)	-4.99 (-0.74)	-5.23 (-0.77)	-2.04 (-1.51)	-2.20 (-1.62)
Currency risk	38.11 ** (2.88)	36.70 ** (2.81)	35.36 (1.96)	31.28 (1.68)	27.46 ** (6.64)	27.46 ** (6.64)
U.K. borrowers	49.85 ** (5.23)	52.64 ** (5.64)	-10.10 (-0.53)	-6.30 (-0.32)	6.43 (1.58)	6.44 (1.58)
Crisis	174.01 ** (16.26)	175.83 ** (16.59)	33.70 (0.74)	37.16 (0.81)	86.53 ** (20.73)	85.91 ** (20.05)
Risk free rate	-0.16 ** (-4.46)	-0.16 ** (-4.54)	-0.03 (-0.31)	-0.02 (-0.26)		
Volatility	0.49 (1.64)	0.44 (1.51)	2.42 ** (2.81)	2.36 ** (2.71)	2.98 ** (17.88)	2.97 ** (17.89)
EUSA5y-Libor3M	-0.46 ** (-7.41)	-0.45 ** (-8.43)	-0.52 ** (-4.35)	-0.52 ** (-4.44)	-0.16 ** (-6.31)	-0.16 ** (-6.13)
Commercial			25.01 (0.99)	22.90 (0.90)	-17.93 ** (-3.82)	-16.88 ** (-3.56)
Industrial	10.29 (1.14)	9.98 (1.12)	27.34 (0.99)	25.80 (0.93)	0.69 (0.17)	1.77 (0.43)
Utilities	12.92 (1.41)	6.34 (0.81)	-55.51 (-1.52)	-58.11 (-1.59)	-39.93 ** (-8.59)	-38.77 ** (-8.14)
Transportation	14.33 (1.39)	13.12 (1.32)	110.02 ** (3.64)	109.56 ** (3.74)	12.16 (1.47)	13.94 (1.66)
Government	7.18 (0.31)	8.56 (0.37)			25.68 * (2.20)	27.60 * (2.53)
Other					69.91 ** (3.42)	71.75 ** (3.52)
Rating			27.44 ** (8.65)	27.56 ** (8.74)	29.06 ** (43.11)	29.21 ** (43.56)
Number of observations	1,029	1,029	364	364	8,686	8,686
Adjusted R^2	0.51	0.63	0.46	0.46	0.43	0.43
F	90.00	87.18	11.45	11.06	261.21	257.06

Table 5.10: Regression analyses of the term structure of credit spreads.[377]

[376] We have also attempted alternative quadratic and square-root specifications, but the results were not significant for this work and therefore are not reported.

[377] Model [8a] is similar to model [1a] adding the logarithmic of maturity. Rating variable was omitted either because of collinearity or because of the significant reduction in the number of observations (from

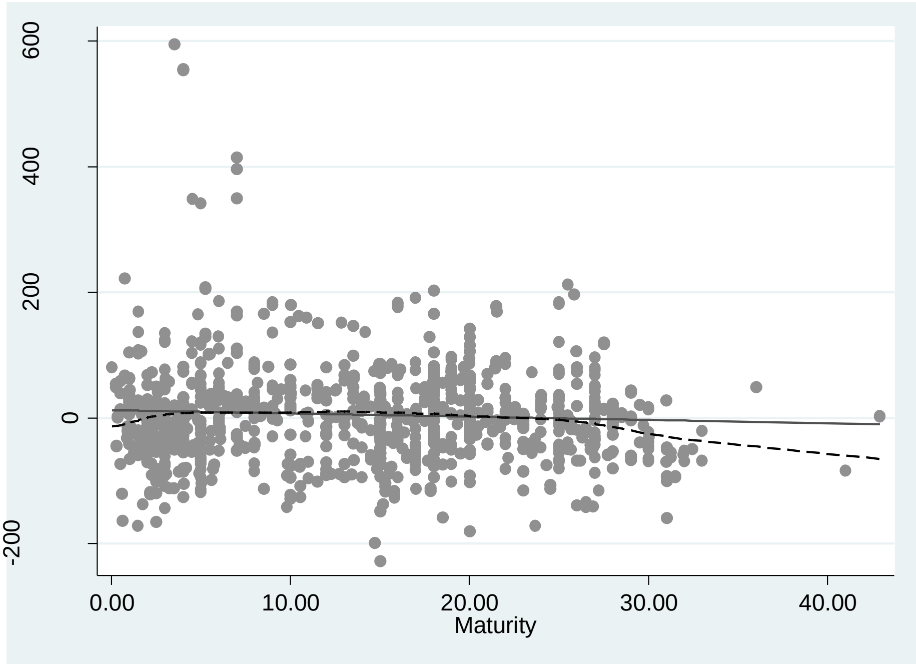
For PF loans, a robust hump-shaped relationship between credit spread and maturity is found and plotted in Graphs 3 and 4. Graph 4 presents the augmented component-plus-residual plot based on regression [8a] and depicts the partial relationship between PF loans credit spread and maturity, once all other micro and macro factors have been controlled for. The straight line in Graph 4 corresponds to the regression model. The curved line reflects the fitting process based on non-parametric regression called local weighted scatterplot smoothing (lowess).



Graph 3: Credit spread *versus* maturity with confidence bands: PF loans.[378]

1,029 to 39) that it would impose. The *t*-statistics reported in parentheses are based on heteroskedasticity-consistent standard errors. **, * indicate that the reported coefficient is statistically significant at the 1% and 5% level, respectively.

[378] As with other confidence intervals and hypothesis tests in OLS regression, the standard errors and bands described depend on the assumption of independent and identically distributed errors. Hence, next we present the augmented component-plus-residual plot (Graph 4) after adjusting for heteroskedasticity using the methodology proposed by Huber (1967) and White (1980).



Graph 4: Term structure of credit spreads for PF loans.[379]

Our findings are similar to those presented by Sorge and Gadanecz (2008), who show a hump-shaped term structure of credit spreads for PF loans. In project finance, projects usually start to generate revenues after a relatively long construction period. As loan repayment relies primarily on the project's cash flows, obtaining credit at longer maturities might be critical to ensure a project's financial viability. This short-term liquidity risk may explain why a standard upward-sloping relationship between maturity and credit spread do not apply to PF, as is the case for CB. Additionally, project lenders usually exercise a much more active control and supervision over the project's advancement than they would in SDF transactions.[380]

In models [8b] and [8c] we also augmented our baseline regression results for AS and CB issues, respectively, including the natural logarithm of maturity as an independent

[379] The curved line reflects lowess smoothing based on the default bandwidth of .5, or half the data. According to Hamilton (2006), "*[I]n general the lowess command is more specialized and more powerful… for fitting process.*"

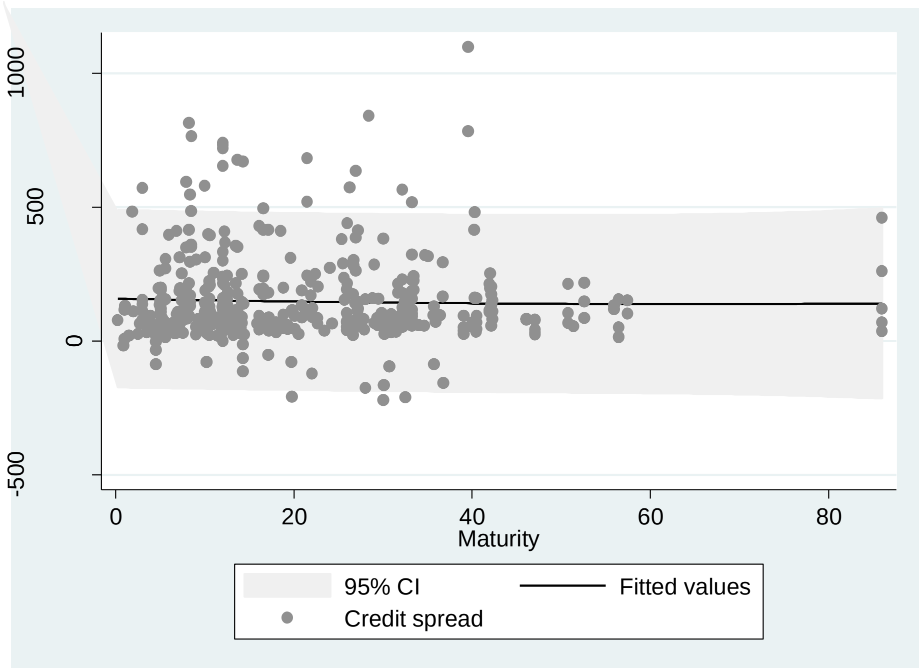
[380] Based on the Merton's (1974) contingent claims approach, we can argue that highly leveraged obligors, typical of project financing, might exhibit a hump-shaped term structure of credit spreads. See Sorge and Gadanecz (2008) for further discussion of this subject.

variable. The logarithmic term turns out insignificant for AS bonds, which is in line with our previous results and with the relationship between credit spread and maturity plotted in Graph 5. If we analyze the augmented component-plus-residual plot shown in Graph 6 – based on model [8b] – we can conclude that although not significant, there is a negative relationship between credit spread and maturity. Further empirical analysis of this question would be beneficial for future research, by using a database with a higher number of observations.[381]

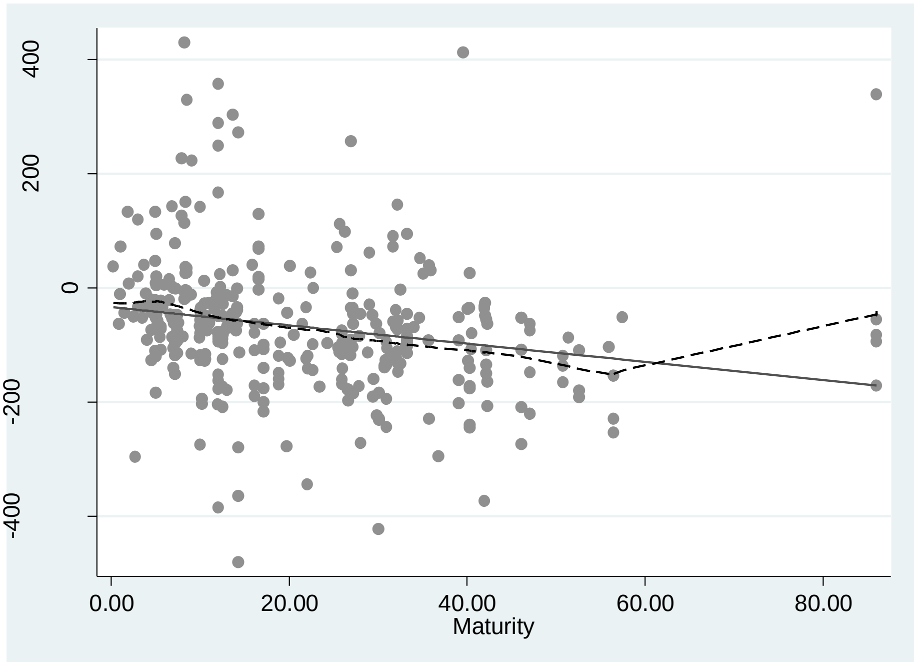
The insignificant linear relationship between credit spread and maturity can be easily explained by the intrinsic characteristics of AS transactions. Contrary to the traditional secured bonds, where it is the ability of the originator (or issuer) to generate sufficient cash flows to service the debt that determines the risks of the transaction, in securitization the source of repayments/funds shifts from the cash flows of the issuer to the assets and cash flows pledged as collateral to the issue. Therefore, the length of the securities issued in an AS transaction typically matches the length of the assets used as collateral; i.e., in general, the payoff profile of the underlying assets is closely related to the maturity of the issues.

Finally, the negative slope of the straight line in Graph 6 can be explained by the term structure of credit spreads shown by different AS instruments. Certain types of assets underlying an AS structure lend themselves more easily to issues with longer maturity levels. Mortgages in general are considered to have longer maturities – the most common type of residential mortgage loan is a 30-year loan – and thus an MBS tranche of average size matures just over 30.31 years, which is a long period if we compare this with the average 17.29 years for ABS. Additionally, the relative pricing of AS issues shows that average credit spreads are lower for MBS, with 115.64 bps, than they are for ABS, with 162.01 bps.

[381] We have also run model [8b] for ABS and MBS sub-samples and we find interaction terms of maturity with credit spread to be insignificant in both linear and non-linear specifications.



Graph 5: Credit spread *versus* maturity with confidence bands: AS Bonds.[382]

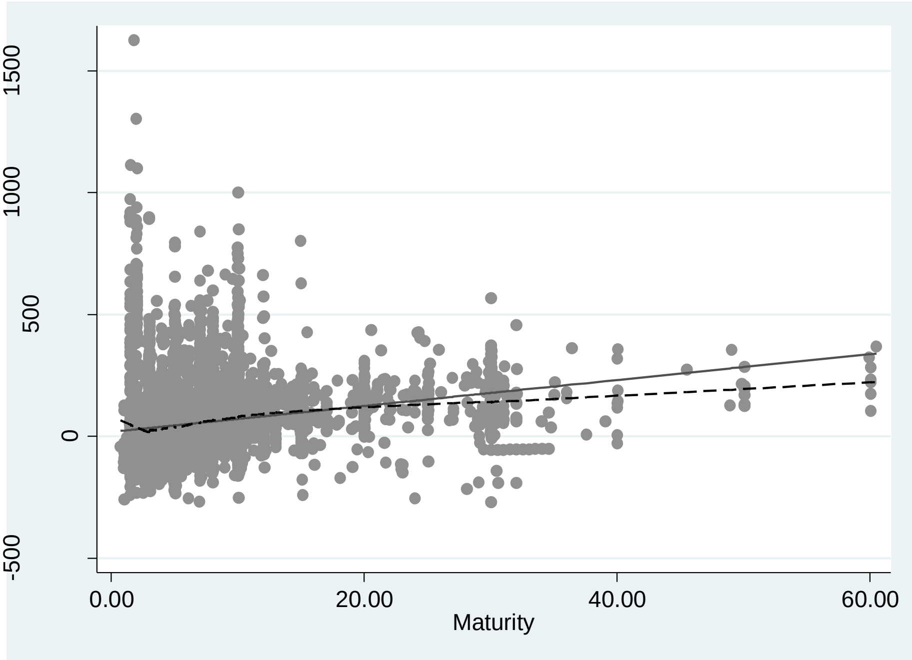


Graph 6: Term structure of credit spreads for AS bonds.[383]

[382] As with other confidence intervals and hypothesis tests in an OLS regression, the standard errors and bands described depend on the assumption of independent and identically distributed errors. Hence, next we present the augmented component-plus-residual plot (Graph 6) after adjusting for heteroskedasticity using the methodology proposed by Huber (1967) and White (1980).

[383] The curved line reflects lowess smoothing based on the default bandwidth of .5, or half the data. The curve's upturn at the far right can be disregarded as a lowess artifact, as only a few cases determine its location toward the extremes. We thus have no doubt about the model's adequacy.

Table 5.10 also shows that a linear positive relationship between credit spread and maturity remains strongly significant for CB issues. This idea is corroborated by Graph 7, which presents the augmented component-plus-residual plot based on model [8c].



Graph 7: Term structure of credit spreads for CB.[384]

Our results and analysis help to explain why maturity, which is a major systematic driver of the cost of debt in SDF transactions, only has a marginal linear effect on the credit spread of SF transactions. In a portfolio of SDF (CB) issues, the risk associated with longer maturities can never be fully diversified as, to some extent, future market conditions are uncertain for every borrower; i.e., a portfolio of CB with longer maturities contains at least some systematic risk that in turn makes maturity a positive driver of credit spread. By contrast, a portfolio of PF and AS issues effectively eliminates most of this source of systematic risk by virtue of credit enhancement mechanisms or other structuring devices that reduce lender exposure by altering borrowers risk profiles over time. This can help to understand why SF transactions seem less risky than lending directly to corporate by means of an SDF financial instrument.

[384] The curved line reflects lowess smoothing based on the default bandwidth of .5, or half the data. The curve's downturn at the far right can be disregarded as a lowess artifact, because only a few cases determine its location toward the extremes. We thus have no doubt about the model's adequacy.

5.4. Concluding Remarks

Previous sub-sections investigated the extent to which SF and SDF are priced by common factors. Our purpose was to analyze the impact of common pricing features on credit spread by type of transaction. Taking these financial instruments as a whole, we saw that all Chow test statistics were higher than the critical levels, and therefore we rejected the hypothesis that the impact of pricing factors on credit spread do not differ significantly among and between SF and SDF transactions. The regression analyses we performed suggest that SF and SDF are in fact different instruments. Even among SF transactions, despite some similarities between PF loans and AS bonds the impact of the pricing factors on credit spread differs between them. Thus, we reject hypothesis 3.[385]

This also means that we cannot directly test whether spread on SF is lower than or equal to the credit spread on SDF (Hypothesis 2) by including a PF and an AS dummy variable in a regression of a sample of all loan types. However, and based on our univariate analysis, we conclude (see sub-section 4.4.3) that average credit spreads are statistically and significantly higher for PF loans than they are for AS bonds and CB and that the average credit spreads for AS and CB issues do not differ significantly. Therefore, we only accept the hypothesis that the credit spread on SF is lower than or equal to the credit spread on SDF for AS issues.

Our main conclusion is that capital markets for SF and SDF transactions are distinct and thus the relevant pricing factors of these financial instruments also differ. We have started by estimating equation 5.1 for PF loans, AS and CB issues for high-information samples (tranches for which credit spread information is available). This resulted in a total of 1,029 observations for PF loans, 439 for AS bonds, and 10,543 for CB. Despite the additional information available on SF and SDF, rather than restrict ourselves to analyzing a single sample with all of the information available (which would yield a sample size of less than 39 tranches), we studied seven different sub-samples, grouped based on the availability of key data items (e.g., rating, credit accessibility, fees, and collateral). These samples and their comparison with our first regression analysis are

[385] The substantial differences we found between SF and SDF transactions regarding the impact of common pricing factors on credit spread indicate SF and SDF transactions are priced in segmented capital markets. As such, our results form a significant contribution to current research in the field of structured finance, as the estimates concerning the impact size of each variable's impact on the credit spread by type of transaction may help financial institutions in structuring the technical features of SF transactions.

presented in Annex 7 (models grouped by new introduced variables) and Annex 8 (models grouped by the type of issue).

We can summarize our findings in Table 5.11, which gives an overview of the variables, their expected sign, and our findings. We find, for example, that:

1. The impact of credit rating on the credit spread does not differ for SF and SDF transactions. The pattern indicates that the spread rises when the rating worsens, which is consistent with the empirical literature.
2. As expected, the loan to value ratio has a different impact on SF transactions. Loan to value ratio is positively related with PF loans, since larger tranches might imply higher risk for lenders, as they constitute a larger share in their loan portfolio. In contrast, we find a negative coefficient sign for AS bonds, as tranches with a higher loan to value ratio (senior tranches) have a higher expected recovery rate and therefore require a lower return.
3. The impact of the number of banks on the credit spread differs for PF loans and AS and CB issues. While the number of banks has a negative impact on the credit spread for AS and CB issues, it has a positive or insignificant impact for PF loans. However, it is important to notice that when we control for upfront fee, the impact of the number of banks on PF loan credit spreads becomes positive. This shows, as pointed out by the significantly and positive relationship between upfront fee and credit spread, that credit spreads and fees are usually complements or substitutes in syndicated loans – arrangers are usually ‘paid’ by spreads and fees.
4. Currency risk dummy variable has a significant, positive relationship with the credit spread for SF, as well as for SDF transactions. Although currency risk coefficients for AS and CB issues have the expected features, our findings for PF loans are different from those presented in the empirical literature [e.g., Kleimeier and Megginson (2000)].
5. Contrary to what was expected, borrowers from the U.K. raise funds in PF and CB markets at a higher credit spread compared to borrowers from Continental Europe. For AS bonds, we find that U.K. borrowers’ dummy variable is significantly negative or insignificant.

6. As expected, dummy variables resulting from variable sector have a significantly positive relationship with credit spread for AS bonds. This means that the predicted credit spread is higher for issuers not belonging to the financial institution sector. We also discover, in line with some empirical literature [e.g., Corielli et al. (2010)], that sector does not influence the level of credit spread in PF transactions.
7. The impact of country risk on credit spread differs for SF and SDF transactions. The pattern indicates that spread rises when country risk worsens for PF and CB issues. For AS bonds, our findings show that country risk coefficients are insignificant. This can be explained by the intrinsic characteristics of AS transactions; i.e., they are structured based on the segregation of the assets from bankruptcy risks of the originator and on the implementation of different credit enhancement strategies to meet specific risk levels.
8. Credit accessibility and the slope of the Euro swap curve are highly significant and their coefficients have the expected features: they are positive for credit accessibility (when credit accessibility is lower, borrowers raise funds at a higher credit spread) and negative for EUSA5y-Libor3M (a steeper Euro swap curve is associated with lower spreads).
9. The influence of volatility on credit spread is positive for AS and CB issues and insignificant for PF loans. The finding for PF loan credit spreads can be explained by the fact that PF loans are not traded on a secondary market and thus are not subject to mark-to-market or fair value accounting.
10. As expected, the type of collateral in an AS transaction determines the credit spread. The average credit spreads are statistically and significantly lower for MBS than they are for ABS.
11. Fixed rate and callable variables are highly significant for SDF transactions and their coefficients have the expected features: they are positive and thus when their values increase, an increase in credit spreads is verified. However, we do not find this pattern for AS transactions.

Name	Description	Expected Sign			Findings		
		PF	AS	CB	PF	AS	CB
Dependent variable:							
Credit spread	For loans: Libor spread plus difference between three-month Libor and three-month German Treasury yield at the time of the signing of the loan. For bonds: spread at issue over comparable risk-free government security with a comparable maturity.						
Independent variables: **Microeconomic independent variables**							
Log transaction size	Natural log of the loan or bond transaction size. Transaction size is converted into Euro millions when necessary.	- / I	-	?	- / I	I	?
Log loan to value	Natural log of the loan to value ratio, which represents the ratio of the tranche size to the transaction size of a given loan or bond.	+	- / I	+	+ / I	- / I	NA
Maturity	Maturity of loan or bond, in years.	?	- / I	?	HS	I	+
Number of tranches	The number of tranches for each transaction.	+	-	+	I / +	I / -	+
Number of banks	The number of financial institutions participating in the loan or bond issuance.	?	- / I	-	+ / I	-	-
Currency risk	Dummy equal to 1 for loans that are denominated in a currency different from the currency in the borrower's home country. Dummy equal to 1 for bonds that are denominated in a currency different from the currency in the deal's nationality.	-	+	+	+	+ / I	+
U.K. borrowers	Dummy equal to 1 if the borrower/issuer belongs to U.K.	-	-	-	+	I / -	+
Sector	Dummies equal to 1 if loan or bond finances a borrower/issuer in a certain industry. For each of the following industry groups, a dummy is created: commercial, industrial, utilities, transportation, government, and other. The control group includes financial institutions.	?	+	?	I	+	?
Rating	Loan and bond rating based on the S&P and Moody's rating at close. If missing for loans, S&P and Moody's senior debt rating at close are used. If both rating are available, the average rating is calculated. The rating is converted as follows: AAA=Aaa=1, AA+=Aa1=2, and so on until D=22.	+	+	+	+	+	+
Management fee	Fees (in bps) that are periodically paid to the bank syndicates.	+	+	+	+	I	+
Upfront fee	A fee (in bps) paid by a borrower to a bank or a syndicate of banks for arranging a PF loan.	+	NA	NA	+	NA	NA
Collateral	Dummy equal to 1 if an AS bond is backed by mortgages and 0 otherwise.	NA	-	NA	NA	-	NA
Fixed rate	Dummy equal to 1 if a loan or bond is fixed price and 0 otherwise.	+	+	+	NA	I	+
Callable	Dummy equal to 1 if the bond has a call option and 0 otherwise.	NA	+	+	NA	I	+
Independent variables: **Macroeconomic independent variables**							
Country risk	S&P's country credit rating at close. The rating is converted as follows: AAA=1, AA+=2, and so on until D=22.	+	?	+	+	I	I / +
Crisis	Dummy equal to 1 if the issue date belongs to the crisis period and 0 otherwise.	+	+	+	+	+ / I	+
Risk free rate	The three-month German Treasury bill at the time of the signing of the loan or issuing the bonds - a proxy for the general level of interest rates.	I	+	+	-	I	NA
Volatility	The Chicago Board Options Exchange Volatility Index (VIX). VIX reflects a market estimate of future volatility.	+	+	+	I	+	+
EUSA5y-Libor3M	The slope of the Euro swap curve. Obtained as the difference between the five-year Euro swap rate and the 3-month Libor rate.	?	-	-	-	-	-
Credit accessibility	The iTraxx Europe index. iTraxx is used as a proxy for credit conditions and therefore for credit accessibility by borrowers.	+	+	+	+	I	+

Table 5.11: Definition of variables, expected sign, and findings.[386]

[386] The following characters in Table 5.11 mean: – = negative impact on the credit spread | + = positive impact on the credit spread | I = insignificant impact on the credit spread | ? = sign cannot be determined clearly from either the theoretical or empirical literature | NA = information about this variable is not available | HS = hump-shaped.

In order to test the impact of the 2007/2008 financial crisis and the subsequent European sovereign debt crisis on SF credit spreads, we hypothesize (Hypothesis 4) that after controlling for macroeconomic conditions and loan characteristics, the financial crisis does not have a significant impact on SF credit spreads. Based on the results presented in sub-sections 4.4.4 and 5.3.3 we have rejected hypothesis 4, since: (i) the average credit spread is statistically and significantly higher for PF loans (329.1 bps *versus* 136.9 bps), AS bonds (206.5 bps *versus* 143.5 bps), and CB (220.3 bps *versus* 125.5) during the crisis period; and (ii) when we control for other microeconomic and macroeconomic pricing factors the coefficient for the crisis dummy variable is significantly, positively related to credit spread. In section 5.3.4, we again test this hypothesis, investigating whether our results are robust over time by considering a pre-crisis period from January 1st, 2000 and September 14th, 2008, and a crisis period from September 15th, 2008 through to December 31st, 2011. We have rejected, once again, hypothesis 4, as the 2007/2008 financial crisis and the subsequent European sovereign debt crisis do significantly influence the explanatory power of the regressions, as well as the coefficients on the macro and micro pricing factors (in sign and in significance) for SF transactions. The same finding was obtained for CB issues.

Given the controversy on the literature regarding the term structure of credit spreads for PF loans and for speculative-grade CB issues, we carried out a multivariate regression analysis (section 5.3.5), attempting to analyze the relationship between credit spread and maturity, controlling for other relevant micro and macro risk factors. Our purpose was to understand the economics underlying the term structure of credit spreads as derived from a large cross-section of Western European SF and SDF loans and bonds. We find that: (i) a hump-shaped term structure of credit spreads constitutes a specific feature of credit risk in PF transactions; (ii) the impact of maturity on AS bond credit spreads is insignificant; and (iii) a linear, positive relationship between credit spread and maturity is strongly significant for CB issues. These findings clearly help to explain why maturity, which is a major systematic driver of the cost of debt in SDF transactions, only has a marginal linear effect on the credit spread of SF transactions. While in a portfolio of CB issues the risk associated to longer maturities can never be fully diversified, a portfolio of PF and AS issues effectively eliminates most of the systematic risk by virtue of credit enhancement mechanisms or other structuring devices that reduce lender exposure by altering borrowers' risk profiles over time.

Additionally, our results regarding the term structure of credit spreads for PF loans have several policy implications. The most important relates to the need to align the term structure of regulatory capital requirements with the term structure of credit risk in project finance. As asserted by Sorge and Gadanecz (2008), "*... a linear maturity adjustment for regulatory capital – albeit a good approximation for bonds and other loans – might be less applicable to project finance exposures*". Considering that we find a hump-shaped relationship between credit spread and maturity, a linear maturity adjustment to capital requirements (credit risk is usually viewed as increasing with maturity) might be less applicable to PF loans. Thus, regulatory capital arbitrage could induce banks to concentrate their loan portfolio in the short-term *vis-a-vis* long-term project finance transactions, which might not be necessarily safer.

From our regression analyses, we can also conclude that, in SDF lending, the borrower usually specifies the amount of debt he/she is seeking, and their creditworthiness becomes the main determinant of loan spreads. By contrast, when an SF transaction is arranged by investment banks, the goal is to come up with the most efficient mix of maturities, spreads, tranches, warrantees, and other credit enhancement mechanisms to manage what lenders perceive to be the risk and the probability of default on the debt. This means that for SF transactions, mainly in AS issues, credit rating becomes the most important pricing factor for this asset class at launch. Our findings are in line with those of Fender and Mitchell (2005), who argue that the increasing complexity of structured finance products creates incentives to rely more heavily on ratings than for other financing instruments, which is usually presented as one of the principal limitations of AS with regard to the 2007/2008 financial crisis.

The nature of the firm as a nexus of contracts is even more apparent in SF than in SDF settings. In PF and AS, a specially incorporated new firm (SPV) is created to manage all contracts and to make cash flows more readily verifiable for lenders. In such cases, it is crucial to design financial contracts with the objective of pre-committing when possible, the possible behavior of SPV management. Careful contract design prevents agency problems between SPV sponsoring firms and lenders, and establishes an effective risk management package. Pre-committing future obligations also reduces the volatility of cash flows available for debt service.

Finally, we should explicitly state that our regression models did not include variables reflecting some characteristics of the borrowers in any direct way – such as borrower liquidity or leverage ratios – despite the likelihood that such variables would prove useful. There are two reasons for this. First, DealScan and DCM Analytics databases does not provide an identification code (i.e., Datastream identification number) for borrowers, so there is no feasible method of matching borrowers to their corresponding accounting or stock price data. Second, it is not at all clear that debt or liquidity ratios for PF and AS borrowers would be comparable to similar ratios for borrowers of CB issuers. Whereas the CB issuer is usually an operating company, the PF and AS borrower is, by definition, a vehicle company without external assets or sources of repayment. However, the extent to which any of these variables could have an impact on SF and SDF credit spreads remains to be explored.

6. The Financing Choice: Structured *versus* Straight Debt Finance

6.1. Introduction

As Chapter 4 has shown, Project Finance (PF) loans are a more expensive type of financing than Corporate Bonds (CB) [Straight Debt Finance (SDF)] and even than other Structured Finance (SF) transactions [Asset Securitization (AS) bonds]. PF issues have lower credit rating and a higher number of banks involved. The sample used in the loan pricing factors also revealed that SF loans and bonds (PF loans and AS bonds) have lower loan to value ratios than SDF issues and have longer time to maturity.

These observations are *ex post* in nature. They do, however, lead to a question concerning the choice between SF and SDF transactions and even between PF loans and AS bonds: *What factors determine a manager's choice between these financing alternatives?* In order to answer this question, the effects of each of the two financing approaches on the overall cost of financing have to be clear. For example, referring to PF transactions, the choice between PF loans and CB is the choice between a higher cost of financing for one investment and the constant cost of capital of the firm (PF loans) *versus* a lower cost of financing for one investment and an increase in the cost of capital of the firm (CB).[387]

We thus want to determine what affects the probability of a new borrower choosing between SF and SDF transactions. Additionally, and given the fact that all common pricing values between AS bonds and PF loans are statistically and significantly different at the 5% level or higher – see Table 4.10 in sub-section 4.4.3 – we have also studied the probability of a new sponsor choosing to structure a new loan as a PF or AS. Similarly, and given certain similarities between AS and CB issues – credit spread, tranche size, and currency risk factors do not differ significantly between the two security classes at the 5% significance level – we also studied the main factors affecting the probability of a new borrower's choice between AS and CB issues.

Additionally, as described in Section 4.3 and further illustrated in Tables 4.5, 4.6, and 4.7, our sample includes SF loans and bonds, as well as SDF bonds signed/issued by borrowers in Western Europe over the years 2000-2011. Given that during this period of

[387] The increased amount of debt increases the risk of bankruptcy. With increased risk of bankruptcy, bondholders and equity holders require higher rates of return.

time we experienced two crises – (1) the early 2000 recession, which affected the European Union mostly during 2000 and 2001, (2) and the 2007/2008 financial crisis and the subsequent European sovereign debt crisis which has been affecting Western European countries since 2008 – we cannot rule out that a flight to quality might have left many borrowers in these countries credit-rationed. As a result, the probability of observing SF deals with relevant pricing information (i.e., our sample selection) might not be random but rather somewhat determined by the same risk characteristics that enter our pricing regressions.

Therefore, we resort to a generalized Tobit model, following Heckman (1979). We perform a maximum likelihood estimation on our credit spread samples of our model specification (models [1a], [1b], and [1c]), simultaneously with a probit selection equation, where the probability of signing a loan or bond is a function of either micro and macro variables. To construct the dependent binary variable for this selection equation, we allocate ones and zeros, respectively, to each type of financing instrument according to whether the issue is presented in the analysis or not.

The remainder of this Chapter is organized as follows: section 2 presents the determinants of the financing choice. Data and methodology used to empirically analyze the factors that explain the choice between and among SF and SDF transactions are presented in section 3. Section 4 describes the empirical results and concludes.

6.2. Determinants of the Financing Choice

As stated in the introduction, choosing between SF and SDF includes a decision related to the firm’s cost of capital, because an increase in leverage increases the required cost of capital. This is the case as SF typically refers to the transfer of a subset of a company’s assets (an ‘activity’) into a bankruptcy-remote corporation or other special purpose vehicle or entity (SPV/SPE). Thus, the assets instrumental to managing the project are separated from the remaining assets of the parties that create the vehicle.

Therefore, the factors affecting the differences in credit spread for SF and SDF transactions also affect the financing choice. The previous analysis of loan and bond pricing factors (Chapter 5) revealed that several pricing factors apply for both SF and

SDF transactions. Thus, differences in credit spreads must originate from differences in these underlying factors. The relevant factors found in the loan pricing analysis are: (i) the tranche size, the loan to value ratio, the number of banks, and currency risk dummy variable – microeconomic variables; and (ii) crisis and EUSA5y-Libor3M – macroeconomic variables. Marginally significant are the time to maturity, the country risk (rating), U.K. borrowers' dummy variable, the seven borrower/issuer business group dummy variables, and risk free rate, volatility, and credit accessibility macroeconomic variables. All these factors should also be important in the financing choice. All variables are the same as defined in equation 5.1 (sub-section 5.3.1).

In influencing the probability of a sponsor to choose SF over SDF, we consider the fourteen variables presented in Table 6.1, which gives an overview of the variables and their expected impact on the sponsor financing choice. With respect to the influence of the individual determinants, the sample characteristics presented in Chapter 4 convey the impression that, when compared to CB, SF tranches are on average larger for AS bonds and smaller for PF loans. On average, we expect that SF tranches are smaller than SDF tranches since tranching (issuance of multiple debt security classes) and the consequent risk dispersion is often cited as one of the major structured finance benefits. Also, loans exposed to currency risk are more likely to be structured as SDF transactions. Conversely, loans with longer maturity and issued by borrowers belonging to countries with higher credit risk are more likely to be structured as SF. Comparing PF loans with AS bonds, we expect that if a sponsor would like to obtain funding for a longer period of time, he will choose to issue securities backed by receivables, rather than structuring a PF transaction.

With respect to the sector or business group, PF is most commonly used for capital-intensive ventures – such as power plants, refineries, toll roads, pipelines, telecommunications facilities, and industrial plants – with relatively transparent cash flows. Thus, we expect that borrowers belonging to industrial, utilities, and transportation industries are more likely to use PF loans. Moreover, and given the importance of the PPPs in Western Europe – PPPs reduce the need for government borrowing, shift part of the risks presented by the project to the private sector, and aim at achieving more effective management of the project –, we also expect that government and public sector entities rely on PF as an important form of allowing a

project to proceed without being a direct burden on the government's budget. AS is the process whereby financial assets are pooled together, with their cash flows, and converted into negotiable securities to be placed into the market; i.e., it is a technique used to transform illiquid assets into securities. The major issuers of AS bonds are companies belonging to commercial and financial industries, with particular emphasis on banks – securitization technique allows the transformation of heterogeneous assets that are mostly not negotiable by banks into liquid and homogenous securities, suitable for trade. With respect to CB, issues are highly concentrated in the financial institution industry (Table 4.2 reports that 67.2% of the total value and 80.8% of the total number of CB transactions are issued by financial institutions). Industrial and commercial industries also account for a significant volume of CB issues.
There is broad consensus that structured finance, more specifically asset securitization, played an important role in the development and propagation of the 2007/2008 financial crisis (see section 3.5). Thus, transactions developed during the crisis period are more likely to be arranged as SDF transactions. However, transactions were more likely to be structured as PF, rather than AS during that period.

The general level of interest rates (risk free rate), the slope of the Euro swap curve (a proxy of the expectations about the future evolution of interest rates), and the market volatility seem to support the use of SF. Finally, an improvement in credit conditions, and therefore of credit accessibility by borrowers, will increase the usage of either SF or SDF. Thus, we cannot clearly determine the impact of credit accessibility on the probability of a sponsor to choose SF over SDF.

In order to test these expected impacts, a generalized Tobit model, following Heckman (1979), has been designed. This methodology and the underlying sample for the empirical analysis are presented in the following section.

Name	Description	Expected Impact		
		SF vs SDF	PF vs AS	AS vs CB
Independent variables:				
Microeconomic independent variables				
Log tranche size	Natural log of the loan or bond tranche size. Tranche size is converted into Euro millions when necessary.	-	-	+
Maturity	Maturity of loan or bond, in years.	+	-	+
Currency risk	Dummy equal to 1 for loans and bonds that are denominated in a currency different from the currency in the borrower's home country or deal's nationality.	-	-	-
Industrial	Dummies equal to 1 if loan or bond finances a borrower/issuer in the industrial sector.	+	+	-
Utilities	Dummies equal to 1 if loan or bond finances a borrower/issuer in the utilities sector.	+	+	-
Financial intitutions	Dummies equal to 1 if loan or bond finances a borrower/issuer in the financial institutions sector.	?	-	+
Transportation	Dummies equal to 1 if loan or bond finances a borrower/issuer in the transportation sector.	+	+	-
Governement	Dummies equal to 1 if loan or bond finances a borrower/issuer in the government sector.	+	+	-
Independent variables:				
Macroeconomic independent variables				
Country risk	S&P's country credit rating at close. The rating is converted as follows: AAA=1, AA+=2, and so on until D=22.	+	+	+
Crisis	Dummy equal to 1 if the issue date belongs to the crisis period and 0 otherwise.	-	+	-
Risk free rate	The three-month German Treasury bill at the time of the signing of the loan or issuing the bonds - a proxy for the general level of interest rates.	+	?	+
Volatility	The Chicago Board Options Exchange Volatility Index (VIX). VIX reflects a market estimate of future volatility.	+	?	+
EUSA5y-Libor3M	The slope of the Euro swap curve. Obtained as the difference between the five-year Euro swap rate and the 3-month Libor rate.	+	?	+
Credit accessibility	The iTraxx Europe index. iTraxx is used as a proxy for credit conditions and therefore for credit accessibility by borrowers.	?	?	NA

Table 6.1: Definition of variables and their expected impact.[388]

6.3. Data and Methodology

In order to test the expected impact on the probability of a sponsor to choose SF over SDF, PF over AS, or AS over CB, we resort to a generalized Tobit model, following

[388] The following characters in Table 6.1 mean: – = negative impact on the probability of a sponsor to choose SF over SDF, PF over AS, or AS over CB | + = positive impact on the probability of a sponsor to choose SF over SDF, PF over AS, or AS over CB | I = insignificant impact | ? = sign cannot be determined clearly | NA = information about this variables is not available.

Heckman (1979). We perform maximum likelihood estimations on our credit spread samples of our model specification (models [1a], [1b], and [1c]) simultaneously with a probit selection equation, where the probability of signing a loan or bond is a function of either micro and macro variables.[389]

We have observed credit spread when a loan is an SF loan or bond *versus* SDF bond (or a PF loan *versus* AS bond or an AS bond *versus* a CB). Then we fit a binomial probit model that predicts the loan's probability of being arranged as an SF transaction. In this circumstance, s_i – the selection indicator – is set to zero or one on the factors underlying that decision. Thus, the selection indicator which is analyzed here is of a binary format: 1 for SF (or PF or AS), 0 for SDF (or AS or CB), whether the issue is presented in the analysis or not. The Heckman selection model assumes that there exists an underlying regression relationship,

$$y_i = X_i\beta + u \tag{6.1}$$

The dependent variable, however, is not always observed. Rather, the dependent variable for observation *i* is observed if

$$s_i = I(z_i\gamma + v \geq 0) \tag{6.2}$$

where:

$$\begin{aligned} &u \sim N(0,\sigma) \\ &v \sim N(0,1) \\ &Corr(u,v) = \rho \end{aligned}$$

Equation 6.1 is the determination equation or outcome equation and equation 6.2 is the selection equation. When $\rho \neq 0$, standard regression techniques applied to the first equation yield biased results. Heckman provides consistent, asymptotically efficient estimates for all the parameters in such models.[390]

The $I(\cdot)$ function equals 1 if the argument is true – if the loan is an SF transaction – and zero otherwise. We observe y_i if $s_i = 1$. The selection function (6.2) contains a set of explanatory factors *Z*, which must be a superset of *X*; i.e., for us to identify the model, *Z*

[389] For a discussion of maximum likelihood estimation see Greene (2012).
[390] For further analysis of Heckman selection models see, among others, Heckman (1979), Baum (2006), Cameron and Trivedi (2010), and Greene (2012).

should contain at least one variable that is not in the outcome equation. The error either in equation 6.1 and equation 6.2, *u* and *v*, respectively, are assumed to have a zero-conditional mean: $E[Xu] = 0$ and $E[Zv] = 0$.

The Heckman (1979) selection model is driven by the notion that some of the *Z* factors for a loan are different from the factors in *X*. For example, whether a sponsor belongs or not to the financial institution industry is likely to influence whether a borrower chooses an SF transaction but might be omitted from credit spread determination equation: it appears in *Z* but not in *X*. Other factors are likely to appear in both equations. For example, the tranche size and whether the loan is arranged during the crisis period will likely influence the borrower decision to choose an SF transaction as well as the credit spread that will be paid in that transaction.

Thus, we fit the model

$$\begin{aligned} Credit\ spread_i = {} & \beta_0 + \beta_1\, Log\ tranche\ size_i + \beta_2\, Log\ loan\ to\ value_i + \beta_3\, Maturity_i \\ & + \beta_4\, Number\ of\ banks_i + \beta_5\, Country\ risk_i + \beta_6\, Currency\ risk_i \\ & + \beta_7\, U.K.borrowers_i + \beta_8\, Crisis_i + \beta_9\, Risk\ free\ rate_i + \beta_{10}\, Volatility_i \\ & + \beta_{11}\, EUSA5y - Libor3m_i + u_i \end{aligned} \tag{6.3}$$

and we assume that credit spread is observed if

$$\begin{aligned} & \gamma_0 + \gamma_1\, Log\ tranche\ size_i + \gamma_2\, Maturity_i + \gamma_3\, Country\ risk_i + \gamma_4\, Currency\ risk_i + \gamma_5\, Crisis_i \\ & + \gamma_6\, Risk\ free\ rate_i + \gamma_7\, Volatility_i + \gamma_8\, EUSA5y - Libor3m_i + \gamma_9\, Industrial_i + \gamma_{10}\, Utilities_i \\ & + \gamma_{11}\, Financial\ \mathrm{int}\, itutions_i + \gamma_{12}\, Transportation_i + \gamma_{13}\, Government + \gamma_{14}\, Credit\ accessibility \\ & + v_i > 0 \end{aligned} \tag{6.4}$$

We use a full maximum-likelihood procedure to jointly estimate *β*, *γ*, and *ρ*. The model is fitted over the entire sample and gives an estimate of the crucial correlation *ρ* – the correlation of *u* and *v* –, along with a test or the hypothesis that $\rho = 0$. The rejection of this hypothesis means that an OLS estimation of equation 6.1 will produce inconsistent estimates of *β*. When running our model we adjusted for heteroskedasticity using the methodology proposed by Huber (1967) and White (1980). We can thus obtain robust standard errors for our credit spread model.

The above described methodology is used to analyze a sample of 599 AS issues, 20,977 CB issues, and 2,859 PF issues. From this entire sample, we have available information on credit spread (high-information samples) for a total of 1,090 PF loans, 439 AS bonds, and 10,551 CB issues (see Tables 4.5, 4.6, and 4.7 in sub-section 4.4.2). The results of this estimation are presented in the following section.

6.4. Results

Results are reported in Table 6.2 for three models: model [1d] – SF loans and bonds *versus* SDF bonds –, model [1e] – PF loans *versus* AS bonds –, and model [1f] – AS bonds *versus* SDF bonds (or CB). We identified several microeconomic and macroeconomic factors as significant determinants of choosing each of the analyzed financial instruments. The reported model chi2 test is a Wald test where all coefficients in the regression model (except the constant) are 0. We clearly reject the null hypothesis.

We start our analysis by looking at the estimation of the determination equation in model [1d]. It is the first time we regress credit spread against micro and macro variables for a sample that simultaneously includes PF loans and AS bonds.[391] The coefficients of maturity, country risk, risk free rate, volatility, and U.K. borrowers' dummy variable are statistically insignificant. The natural log of the tranche size negatively influences the credit spread. This suggests that increasing the tranche size by 100 M€ will reduce the required credit spread by 101.53 bps. Similarly, the slope of the Euro swap curve is significantly and negatively related to credit spread. The loan to value ratio, the number of banks, and the currency risk and crisis dummy variables are significantly and positively related with credit spread. An SF transaction implemented during the crisis period has an average credit spread 192.44 bps higher than an SF transaction arranged during the pre-crisis period.

Next, we will analyze the signs and magnitude of the coefficients obtained for the explanatory factors Z in our selection equations.

[391] Despite the fact that we have concluded that the credit spread associated with PF and AS issues are influenced differently by common pricing factors (we rejected hypothesis 3 because the Chow test statistics in Table 5.2 are all higher than the critical levels), we have decided to implement an analysis of SF issues by aggregating PF loans and AS bonds in one unique sample.

Dependent variable: Credit spread (bps)	Structured Finance (SF) [1d]	Project Finance (PF) [1e]	Asset Securitization (AS) [1f]
Independent variables:			
Intercept	279.252 ** (7.58)	297.993 ** (9.02)	67.357 (0.26)
Log tranche size	-22.048 ** (-4.82)	-24.39 ** (-5.53)	-7.035 (-1.62)
Log loan to value	21.379 ** (4.40)	33.601 ** (6.58)	-29.327 ** (-4.60)
Maturity	0.386 (0.84)	0.235 (0.65)	-0.493 (-0.17)
Number of banks	1.404 * (2.53)	1.939 ** (3.48)	-10.369 ** (-2.69)
Country risk	5.057 (1.59)	9.663 ** (3.58)	-11.168 (-0.85)
Currency risk	56.088 ** (3.51)	49.479 ** (2.75)	-10.028 (-0.48)
U.K. borrowers	19.961 (1.66)	57.462 ** (4.20)	43.518 * (2.30)
Crisis	192.439 ** (11.42)	178.772 ** (11.91)	113.874 * (2.17)
Risk free rate	-0.099 (-1.45)	-0.161 ** (-2.85)	0.164 (0.96)
Volatility	0.036 (0.08)	0.274 (0.69)	2.106 (1.72)
EUSA5y-Libor3M	-0.549 ** (-5.17)	-0.517 ** (-5.87)	-0.304 (-1.08)
Dependent variable: Probability of observing:	SF loan or bond (versus SDF bond)	PF loan (versus AS bond)	AS bond (versus SDF bond)
Independent variables:			
Log tranche size	-0.258 ** (-17.00)	-0.209 * (-2.48)	-0.024 (-1.62)
Maturity	0.046 ** (17.02)	-0.046 ** (-3.73)	0.062 ** (22.99)
Country risk	0.095 ** (8.44)	0.741 ** (3.14)	0.064 ** (3.57)
Currency risk	-0.451 ** (-6.94)	-1.134 ** (-3.13)	0.161 ** (3.15)
Crisis	-0.724 ** (-5.54)	7.261 ** (8.66)	-0.499 ** (-3.77)
Risk free rate	0.001 ** (3.70)	0.005 * (2.12)	0.002 ** (7.28)
Volatility	0.014 ** (3.50)	0.014 (0.37)	0.017 ** (4.11)
EUSA5y-Libor3M	0.003 ** (4.48)	-0.03 (-0.62)	0.005 ** (8.96)
Industrial	0.445 ** (6.18)	1.995 ** (6.72)	-0.106 (-0.84)
Utilities	0.750 ** (9.77)	2.208 ** (7.39)	-0.368 (-1.78)
Financial institutions	-1.369 ** (-15.14)	-10.989 ** (-7.06)	0.018 (0.15)
Transportation	0.485 ** (4.26)	7.751 ** (10.88)	-0.367 (-1.47)
Government	1.311 ** (3.24)	5.967 ** (19.72)	-3.468 ** (-18.25)
Credit accessibility	0.004 ** (3.77)	0.014 (1.44)	
Number of observations	15,255	1,036	21,416
Censored observations	14,317	269	20,977
Uncensored observations	938	767	439
Lambda	-3.424	-14.705	12.377
Wald chi2 test PI-value	0.000	0.000	0.000
Wald test (rho=0) PI-value	0.659	0.004	0.846
Log likelihood	-7,776.081	-4,735.209	-4,345.866

Table 6.2: Regression analyses of the probability of observing an SF loan or bond.[392]

[392] Credit accessibility variable was omitted in model [1f] because of the significant reduction in the number of observations (from 599 to 269) that it would have imposed. The *z*-statistics reported in

With respect to model [1d], borrowers chose an SF transaction when they seek long-term financing and when they belong to a country with higher risk. Similarly, borrowers/issuers in industrial, utilities, transportation and government increase the likelihood of an SF transaction. On the contrary, the probability of observing an SF transaction decreases with the tranche size and currency risk. Several macroeconomic factors significantly determine the selection of an SF transaction. Among these, risk free rate, volatility, the slope of the Euro swap curve, and credit accessibility influence positively the probability of observing an SF loan or bond over a SDF bond. As expected, the 2007/2008 financial crisis decreased the probability of observing an SF loan or bond. Somewhat counter intuitively, the financial institutions' dummy variable is found to decrease the likelihood of a borrower/issuer choosing an SF transaction. However, this can be explained by the fact that from the total number of uncensored observations the major part belongs to PF loans, where financial institutions are the lenders and not the borrowers/issuers. Our findings are in line with the expected impact of micro and macro factors in the financing decision between SF and SDF.

Considering the choice between PF and AS, the following (macro) factors do not influence the decision: volatility, credit accessibility, and the slope of the Euro swap curve (EUSA5y-Libor3M). For these factors, the expected sign of coefficients was not possible to determine clearly (see Table 6.1). As expected, for all sector dummy variables, with the exception of the financial institutions, the coefficients are positive and significant at the 5% level. The coefficient of the financial institutions dummy variable is negative and significant, which means that sponsors belonging to the financial institution industry are less likely to use PF loans; i.e., are more likely to use securitization as a funding instrument. The country risk rating is positive and significant at the 5% level. This leads to the conclusion that a sponsor located in a risky country is more likely to be financed with a PF loan than an AS bond. The same sign can be found for the other analyzed macro variables; i.e., crisis and risk free rate. We can thus conclude that the financial crisis (as expected) led to a transfer in the form of funding based on SF transactions, increasing the use of PF and reducing the use of AS. The negative and significant coefficient for the currency risk dummy variable indicates that

parentheses are based on heteroskedasticity-consistent standard errors. **, * indicate that the reported coefficient is statistically significant at the 1% and 5% level, respectively.

in the case of currency risk AS is preferred. Finally, sponsors prefer AS bonds for larger tranches and funding with a higher time to maturity. Again, these findings are in line with the expected impact on the choice of PF over AS.

The regression results for model [1f] reveal that the tranche size and industrial, utilities, financial institutions, and transportation dummy variables do not have an influence on the financing choice between AS and CB. AS is chosen when issuers seek longer-term sources of funding, are established in riskier countries and bonds face currency risk. As expected, risk free rate, volatility, and the slope of the Euro swap curve positively influence the probability of observing an AS bond *versus* a CB. Again, and due to the relevant role played by securitization in the development and propagation of the 2007/2008 financial crisis, the crisis dummy variable is negative and significant at the 5% level. Finally, the unique sector with a significant impact on the probability of observing an AS instead of a CB issue is government; i.e., issuers in government industry decrease the likelihood of observing an AS transaction.

In models [1d] and [1f] the likelihood-ratio test for $\rho = 0$ – Wald test (rho=0) – lead us to accept the hypothesis of equations (6.3) and (6.4) above being independent.[393] On the contrary, we reject this hypothesis for model [1e], pointing out the presence of selection bias. However, despite loan pricing and the choice between PF and AS being simultaneously determined, re-estimates of the models controlling for this selection bias do not appear to yield results fundamentally different from the ordinary least squares estimation of model [1a] – the sign and significance of micro and macro variables remain the same.

Table 6.3 summarizes our findings, providing an overview of the variables, their expected impact on the financing choice, and our findings. We find, for example, that:

1. The effect of lower tranche size increases the probability of selecting an SF transaction, rather than an SDF transaction. The same takes place in the selection process between PF loans and AS bonds.

[393] The likelihood-ratio test is computationally the comparison of the joint likelihood of an independent probit model for the selection equation and a regression model on the observed credit spread data against the Heckman model likelihood.

Name	Description	Expected Impact SF vs SDF	Expected Impact PF vs AS	Expected Impact AS vs CB	Findings SF vs SDF	Findings PF vs AS	Findings AS vs CB
Independent variables: **Microeconomic independent variables**							
Log tranche size	Natural log of the loan or bond tranche size. Tranche size is converted into Euro millions when necessary.	-	-	+	-	-	I
Maturity	Maturity of loan or bond, in years.	+	-	+	+	-	+
Currency risk	Dummy equal to 1 for loans and bonds that are denominated in a currency different from the currency in the borrower's home country or deal's nationality.	-	-	-	-	-	+
Industrial	Dummies equal to 1 if loan or bond finances a borrower/issuer in the industrial sector.	+	+	-	+	+	I
Utilities	Dummies equal to 1 if loan or bond finances a borrower/issuer in the utilities sector.	+	+	-	+	+	I
Financial intitutions	Dummies equal to 1 if loan or bond finances a borrower/issuer in the financial institutions sector.	?	-	+	-	-	I
Transportation	Dummies equal to 1 if loan or bond finances a borrower/issuer in the transportation sector.	+	+	-	+	+	I
Governement	Dummies equal to 1 if loan or bond finances a borrower/issuer in the government sector.	+	+	-	+	+	-
Independent variables: **Macroeconomic independent variables**							
Country risk	S&P's country credit rating at close. The rating is converted as follows: AAA=1, AA+=2, and so on until D=22.	+	+	+	+	+	+
Crisis	Dummy equal to 1 if the issue date belongs to the crisis period and 0 otherwise.	-	+	-	-	+	-
Risk free rate	The three-month German Treasury bill at the time of the signing of the loan or issuing the bonds - a proxy for the general level of interest rates.	+	?	+	+	+	+
Volatility	The Chicago Board Options Exchange Volatility Index (VIX). VIX reflects a market estimate of future volatility.	+	?	+	+	I	+
EUSA5y-Libor3M	The slope of the Euro swap curve. Obtained as the difference between the five-year Euro swap rate and the 3-month Libor rate.	+	?	+	+	I	+
Credit accessibility	The iTraxx Europe index. iTraxx is used as a proxy for credit conditions and therefore for credit accessibility by borrowers.	?	?	NA	+	I	NA

Table 6.3: Definition of variables, expected impact, and findings.[394]

2. Borrowers chose an SF transaction when they are looking for long-term financing and when they belong to a country with higher risk.
3. Borrowers/issuers in industrial, utilities, transportation and government increase the likelihood of an SF transaction, more specifically a PF transaction. The probability of observing an AS bond issue increases if the borrower belongs to the financial industry. The coefficient of financial institutions for model [1f] is statistically insignificant because financial institutions use either AS bonds and CB to get funding in capital markets.

[394] The following characters in Table 6.3 mean: – = negative impact on the probability of a sponsor to choose SF over SDF, PF over AS, or AS over CB | + = positive impact on the probability of a sponsor to choose SF over SDF, PF over AS, or AS over CB | I = insignificant impact | ? = sign cannot be determined clearly | NA = information about this variables is not available.

4. As expected, the 2007/2008 financial crisis decreased the probability of observing an AS transaction. However, when choosing among SF transactions, the crisis increased the probability of observing a PF loan.
5. Other macroeconomic factors significantly determine the selection of an SF over an SDF transaction. Among these, the level of the interest rates, market volatility, the slope of the Euro swap curve, and credit accessibility positively influence the probability of observing an SF loan or bond.
6. Market volatility, the slope of the Euro swap curve, and credit accessibility proves to be irrelevant in the process of the financing decision between PF and AS.

7. Summary and Conclusions

This chapter summarizes and concludes this dissertation. A discussion on the conclusions, as well as some of their implications are summarized in the first section. The second section presents the main results of the empirical research carried out. Suggestions for further research conclude the chapter.

7.1. Concluding Remarks

Structured finance is a relatively new, yet a large and rapidly growing field of Corporate Finance. Despite its importance, there has been very little academic research on structured finance. This dissertation is an attempt to fill that void and to explain what structured finance is and why firms use it. Additionally, structured transactions such as securitization, structured leases, leveraged acquisitions, and project finance are important financing instruments and should be included in a financial manager’s toolkit. Hence, we ought to bring together in one document a set of relevant contributions, developing a synthesis portraying the state of the art of structured finance transactions.

This work offers interesting findings of both theoretical and practical interest. For academic research, the dissertation provides a set of examples showing why financial structures matter and how. Contrary to the perfect markets world of Modigliani and Miller (1958), financial structures matter because they affect investment incentives, deadweight costs, and asset cash flows. For practitioners, this dissertation presents a framework for understanding why structured finance creates value and when to choose it instead of straight debt financing. We argue that structured finance reduces the all-in cost of financing.

In particular, firms use structured finance to reduce costly agency conflicts resulting from creating asset-specific governance solutions to mitigate free cash flow problems and prevent opportunistic behavior. Moreover, any transaction which is specifically structured using an SPV and is secured by ring-fencing assets producing cash flows solely for supporting the transaction, allows the issuer to obtain better credit ratings and/or leverage than it would be possible by issuing senior secured debt, because it reduces asymmetric information problems.

Another interesting finding of our research lies in the fact that the existence of substantial differences among and between structured finance and straight debt finance transactions, with respect to the impact of common pricing variables on credit spread, indicates that these transactions are priced differently. The investment banks in charge of structuring the technical features of certain PF and AS issues may find the estimates a useful tool concerning the size of each variable's impact on the issuance credit spread, primarily after the 2007/2008 financial crisis and the subsequent European sovereign debt crisis.

Empirically, some papers have been published on the performance of such transactions in several countries, but always on an individual basis. Thus, the contribution of this dissertation is to assess simultaneously the key theoretical aspects for the different types of structured finance products. Considering the increasing complexity and sophistication of financial products, and the increasing interdependence of financial markets, it becomes important to understand what is structured finance and what are the main challenges arising from this important segment of capital markets, in a way that prudential standards can guarantee the market stability across periods of crises. Ultimately, the dissertation contributes to the European debate on structured finance, always having in mind the fundamentals and benefits behind these type of transactions.

To understand the benefits of structured finance we need to identify its motivations. Taking into account the available literature on the subject, we have identified the following categories of key economic benefits provided by structured finance: (1) it enables the financing of a unique asset class that (i) previously may have been financed only through traditional borrowing instruments or (ii) could not be financed at all without structured finance; (2) it can reduce borrowing costs; (3) it contributes to more complete capital markets, improving operational and informational efficiency; (4) it can reduce agency costs; (5) it contributes to a reduction of information asymmetries; (6) it allows the issuer to reach higher leverage levels, as compared to senior unsecured debt, thus increasing tax shields/savings; (7) it permits the originator/sponsor to improve/protect financial and regulatory ratios; (8) it may transfer the risk of assets or liabilities and allow an originator to do additional business without expanding its balance sheet; and (9) it grants more flexibility to issuers, in terms of maturity structure, security design, and asset types.

Despite the common motivations that characterize all types of structured finance transactions (i.e., reduction of information asymmetries and higher leverage and tax shields/savings), we have concluded that securitization and project finance are the transactions with more common economic motivations or benefits (see Table 3.2). This is a very relevant conclusion, as we have used asset securitization bonds and project finance loans as proxies for structured finance transactions in our univariate and multivariate regression analysis.

Structured finance transactions are, however, fairly complex and involve a significant amount of cash flow evaluation, due diligence, negotiation, and legal procedures. Consequently, structuring such deals is more costly than common corporate financing. We found that complexity and higher transaction costs are common problems to all of structured finance transactions.

Several authors pointed out that structured finance – more specifically securitization – played a significant role in the development and propagation of the 2007/2008 financial crisis. The transition from the traditional originate-to-hold model to the originate-to-distribute model, as well as its reliance on credit markets as a continuing source of credit, has been blamed by academics and practitioners for the financial crisis of 2007/2008. If the originator does not hold the credit it originates, but distributes the loans and their risks to other entities through securitization, the originator has a reduced incentive to monitor the credit granting process.

Hence, this model brings with it a major principal-agent problem in the credit screening process, because the credit incentives of the originator are not aligned with those of the entity that ultimately holds the loan. When we add the growing complexity associated with securitization transactions, the result is a 'market for lemons' problem, leading to the collapse of the market for securitized assets. In short, the major problem underlying the financial crisis was an asymmetric information problem; specifically an 'information distance' problem between the two extremes of any structured financial contractual architecture.

The 2007/2008 financial crisis demonstrated that, in securitization, the value of the underlying cash flows varies with their repackaging, and that repackaging risk does not just eliminate it. Additionally, when market deterioration becomes systemic, SPVs may be unable to withstand market inertia, and triggers will eventually be breached – complex securitization products have introduced systemic risk into the financial system and might indeed have multiplied it. However, the logical conclusion is not that the concept of structured finance is inherently flawed, but rather that we need to improve its associated contractual architecture. Like in any new tool or concept, there still remain some imperfections.

Looking forward, investors need to learn more about which structures are most appropriate for which assets and cash flows, and regulators and policy makers as well have to introduce important changes in the way such transactions can be implemented. Some key factors can thus be presented that may help to overcome problems related to structured finance transactions and prevent future financial crises, namely: (1) reduce complexity; (2) increase transparency; (3) increase standardization; (4) improve disclosure of underwriting standards; (5) increase the alignment of incentives between originators/borrowers and investors/lenders; (6) reduce overreliance on credit ratings; (8) increase risk management and implement risk mitigation procedures; and (9) allow investors to understand the benefits and drawbacks of these type of transactions.

Looking to the securitization market, the use of securitization transactions has increased since the beginning of the financial crisis. However, the European sovereign debt crisis has limited the increase of securitized products; and its use has changed since that time, namely because an increasing number of banks have underwritten their own securitization programs, to use them as a guarantee for obtaining resources in the auctions of the European Central Bank (ECB), issuing the so-called Covered Bonds. Referring to PF, the financial crisis and the subsequent European sovereign debt crisis, as well as the contagion effect that they have had on the real economy, forced many governments to carry out intense interventions, aiming at increasing the level of private investment, in an effort to strengthen their respective economies, namely by increasing infrastructure capital of their countries. However, this goal clashes with the severe budget constraints that many European governments are already facing today. The bottom line is the need for private investment in public infrastructure, which in turn calls for a substantial increase of PF transactions, in the form of PPPs projects.

7.2. Summary of Empirical Findings

This work compared the financial characteristics of a large sample of structured finance (SF) transactions (project finance loans and asset securitization bonds) with a sample of straight debt finance (SDF) transactions (corporate bonds). Our 'full sample' contained information on 24,435 debt tranches (worth Euro 6,297.8 billion) issued in the international capital markets from January 1st, 2000 through to December 31st, 2011. 'Structured finance full sample' contained information on 599 asset securitization issues (worth Euro 179.1 billion) and 2,859 project finance issues (worth Euro 332.1 billion), extracted from DCM Analytics database and Dealscan database, respectively. Our 'straight debt finance full sample' contained information on 20,977 corporate bond issues (worth Euro 5,786.5 billion), extracted from DCM Analytics database.

We found that:

1. Project finance (PF) loans have higher credit spreads (198.3 bps) than AS bonds (148.9 bps) and CB (157.6 bps) and that average credit spreads for AS and CB issues do not differ significantly. Therefore, we only accepted the hypothesis that the credit spread on SF is lower than or equal to the credit spread on SDF for AS issues (Hypothesis 2). Our findings diverged from those presented by Hu and Cantor (2006) and Maris and Segal (2002), which stated that securitization bonds credit spread have been higher than corporate bonds credit spread.
2. PF loans in Western Europe have higher average credit spread (198.3 bps *versus* 130 bps) and that PF, AS (148.9 bps), and CB (157.6 bps) issues have higher average credit spread in comparison with the spread for all syndicated loans (134 bps) in the study of Kleimeier and Megginson (2000). However, based on recent samples Gatti et al. (2007) and Corielli et al. (2008) found a similar average spread for PF loans. Finally, Vink and Thibeault (2008) presented lower average spread for ABS (99.2 bps) and MBS (73.9 bps).
3. There are important univariate differences between the three types of debt issues and thus we rejected Hypothesis 1. Both AS (299.1 M€) and CB (275.9 M€) issues have a significant higher tranche size in comparison with PF loans (116.2 M€). SF transactions (PF loans and AS bonds) have longer average maturity,

higher management fees, lower loan to value ratios, and are more likely to have floating price and to be guaranteed. PF loans have a higher number of banks involved, which calls for higher management fees, have a lower credit rating, tranche size and number of tranches.

4. Comparing PF loans with AS bonds, if a sponsor aims at obtaining funding for a longer period of time, they will choose to issue securities backed by receivables, rather than structuring a PF transaction – an AS of average size matures just over 20.9 years, which is a long period if compared with the average 13.6 years for PF loans.
5. PF loans in Western Europe are much less likely to be subject to currency risk and PF loan borrowers are, on average, located in far riskier countries. Additionally, PF lending tends to be more risky than AS and CB issues, because the average credit rating for PF loans is significantly higher and either the average level of management fee or the average number of banks participating are significantly larger than the average for AS and CB issues.
6. Credit spread, tranche size and currency risk do not differ significantly between AS and CB issues. On the contrary, AS bonds have an average lower credit rating, lower loan to value ratio, lower number of bookrunners and a higher management fee when compared to CB. Finally, a far higher fraction of AS bonds are arranged for U.K. borrowers.
7. With respect to sector or business group, PF is most commonly used for capital-intensive facilities and utilities – such as power plants, refineries, toll roads, pipelines, telecommunications facilities, and industrial plants – with relatively transparent cash flows. The major issuers of AS bonds are companies belonging to commercial and financial industries, with particular emphasis on banks – the securitization technique allows the transformation of heterogeneous and mostly non negotiable assets into liquid and homogenous securities, suitable for trade. With respect to CB, issues are highly concentrated in the financial industry. Industrial and commercial industries also account for a significant volume of CB issues.

In an attempt to contribute to the existing literature on debt pricing determinants we analyzed the impact of the common pricing features on SF (PF loans and AS bonds) and SDF (CB) credit spread. To compare the common pricing characteristics associated with PF, AS and CB issues, we selected from our 'full sample' those issues for which we could find complete data on credit spread. This screen has yielded a "high-information" sub-sample of 12,080 loans (worth 4,962,996 M€), of which 1,090 (worth 158,487 M€) have been classified as PF loans, AS bonds represent 439 issues (worth 140,733 M€), and 10,551 are CB issues (4,663,777 M€).

We investigated the extent to which SF and SDF are priced by common factors. Our purpose was to analyze if SF and SDF transactions are functionally equivalent financial instruments priced in a single market. Taking these financial instruments as a whole, we saw that all Chow test statistics were higher than the critical levels, and therefore we rejected the hypothesis (Hypothesis 3) that the impact of pricing factors on credit spread do not differ significantly among and between SF and SDF transactions. This means that it was not possible to directly include a PF and an AS dummy variable in a regression of a sample of all loan types. Applying the same pricing estimation models to each type of issue, revealed that most of the common pricing characteristics associated with these transactions have a different impact on the credit spread exhibited by the value of the coefficients. The regression analyses we performed suggest that SF and SDF are in fact different instruments. Even among SF transactions, despite some similarities between PF loans and AS bonds the impact of the pricing factors on credit spread differs between them.

We started by estimating equation 5.1 for PF loans, AS and CB issues, for high-information samples. Despite the fact that additional information on SF and SDF has been available, rather than restrict ourselves to analyzing a single sample with all of this information available (which would yield a sample size of less than 39 tranches), we studied seven different sub-samples, grouped based on the availability of key data items (e.g., rating, credit accessibility, fees, and collateral). We found, for example, that:

1. The impact of credit rating on the credit spread does not differ between SF and SDF transactions. The pattern indicates that the spread rises when the rating worsens, which is consistent with the empirical literature.

2. As expected, the loan to value ratio showed a different impact on SF transactions. Loan to value ratio proved positively related to PF loans, since larger tranches might imply higher risk for lenders, as they constitute a larger share in their loan portfolio. In contrast, we found a negative coefficient sign for AS bonds, as tranches with a higher loan to value ratio (senior tranches) have a higher expected recovery rate and therefore require a lower return.
3. The impact of the number of banks on the credit spread diverges between PF loans and AS and CB issues. While the number of banks had a negative impact on the credit spread for AS and CB issues, it had a positive or insignificant impact for PF loans. However, it is important to notice that when we controlled for upfront fees, the impact of the number of banks on PF loan credit spreads became positive. This shows, as pointed out by the significantly and positive relationship between upfront fees and credit spread, that credit spreads and fees are usually complements or substitutes in syndicated loans.
4. Currency risk dummy variable had a significant, positive relationship with the credit spread for SF, as well as for SDF transactions. Although currency risk coefficients for AS and CB issues showed the expected features, our findings for PF loans were different from those presented in the empirical literature [e.g., Kleimeier and Megginson (2000)].
5. Contrary to what was expected, borrowers from the U.K. raised funds in PF and CB markets at a higher credit spread compared to borrowers from Continental Europe.
6. As expected, dummy variables resulting from the categorical variable sector had a significantly positive relationship with credit spread for AS bonds. This means that the predicted credit spread is higher for issuers not belonging to the financial sector. We also found, in line with some empirical literature [e.g., Corielli et al. (2010)], that sector does not influence the level of credit spread in PF transactions.
7. The impact of country risk on the credit spread was positive for PF and CB issues and insignificant for AS bonds. This can be explained by the intrinsic characteristics of AS transactions. Credit accessibility and the slope of the Euro swap curve were highly significant and their coefficients had the expected

features: they were positive for credit accessibility (when credit accessibility is lower borrowers raise funds at a higher credit spread) and negative for EUSA5y-Libor3M (a steeper Euro swap curve is associated with lower spreads). The influence of volatility on credit spread was positive for AS and CB issues and insignificant for PF loans. The finding for PF loan credit spreads can be explained by the fact that PF loans are not traded on secondary markets and thus are not subject to mark-to-market accounting.

8. As expected, the type of collateral in an AS transaction determined the credit spread. The average credit spreads were statistically and significantly lower for MBS than they were for ABS. Contrary to AS, fixed rate and callable variables were highly significant for SDF transactions and their coefficients were positive, as expected.

Given the controversy in the literature with respect to the term structure of credit spreads for PF loans and for speculative-grade CB issuers, we have implemented a multivariate regression approach, attempting to analyze the relationship between credit spread and maturity, controlling for other relevant micro and macro risk factors. Based on a loan pricing literature review, we verified the hypothesis of a hump-shaped term structure of credit spreads for PF loans, a positive relationship for CB, and a negative relationship for AS bonds. For PF loans, a robust hump-shaped relationship between credit spread and maturity was found – maturity becomes significant after augmenting our baseline multiple regression with a non-linear maturity component (logarithm of maturity). The logarithmic term turned out insignificant for AS bonds and a linear positive relationship between credit spread and maturity remained strongly significant for CB issues. Our results and analysis help to explain why maturity, as a major systematic driver of the cost of debt in SDF transactions, only has a marginal linear effect on credit spread of SF transactions. A portfolio of SDF (CB) issues with longer maturities contains at least some systematic risk, which in turn makes maturity a positive driver of credit spread. By contrast, a portfolio of PF and AS issues effectively eliminates most of this source of systematic risk, by virtue of credit enhancement mechanisms or other structuring devices, which reduce lender exposure, by altering borrowers’ risk profiles across time.

Our results relating to the term structure of credit spreads for PF loans have several policy implications. Our work offered a suggestion for bank regulators on how to effectively align capital requirements with the term structure of credit risk in PF transactions. Our results suggest that a linear maturity adjustment might not fit PF exposures well, despite being appropriate for bonds and other loans in general. This is particularly important, because bank capital regulators should provide market participants with incentives for a prudent and, at the same time, efficient allocation of resources across asset classes and maturities. Additionally, given the fundamental contribution of PF to economic growth, especially in a time of financial crisis in Europe, an incentive should be given to internationally active banks in the PF lending business.

In order to test the impact of the 2007/2008 financial crisis and the subsequent European sovereign debt crisis on SF credit spreads, we hypothesized (Hypothesis 4) that, after controlling for macroeconomic conditions and loan characteristics, the financial crisis did not have a significant impact on SF credit spreads. We have rejected hypothesis 4, since:

1. The average credit spread is statistically and significantly higher for PF loans (329.1 bps *versus* 136.9 bps), AS bonds (206.5 bps *versus* 143.5 bps), and CB (220.3 bps *versus* 125.5) during the crisis period.
2. When we controlled for other microeconomic and macroeconomic pricing factors, the coefficient of the crisis dummy variable was significantly and positively related to credit spread.
3. When examining whether our results were robust across time, by considering a pre-crisis period – from January 1st, 2000 through to September 14th, 2008 – and a crisis period – from September 15th, 2008 through to December 31st, 2011 – we have rejected, once again, hypothesis 4, as the 2007/2008 financial crisis and the subsequent European sovereign debt crisis did significantly influence the explanatory power of the regressions, as well as the coefficients of the macro and micro pricing factors (in sign and in significance) for SF transactions.

The same finding was obtained for CB issues. For PF loans, we have identified a change in the type of factors explaining credit spreads, from marketability factors (maturity and number of banks) to default factors (loan to value and country risk). The statistical significance of log loan to value might be explained by the fact that a higher loan to value ratio means greater risk for lenders, since such a loan constitutes a larger share in its loan portfolio. Additionally, during the crisis period, banks lost balance sheet capacity to lend (huge losses in assets lead to difficulties related to bank solvency).

The significantly and positive relationship between country risk and credit spread during the crisis period was not a surprise, since rating agencies downgraded sovereign bond ratings from several Western European countries (e.g., Belgium, Greece, Ireland, Italy, Portugal, and Spain). With regard to SDF transactions, a change in coefficient signs happened for four variables: variables for U.K. borrowers and country risk were significantly and positively related to CB issues credit spread. U.K. borrowers' dummy variable became significantly, positively related to CB issue credit spread during the crisis period, due to resulting liquidity problems (funding liquidity and balance sheet liquidity) that strongly affected U.K. financial institutions, which issued almost 50% of all CB issued in the U.K. Log transaction size variable became significantly, positively related to credit spread while the number of tranches became significantly, negatively related to credit spread. The change in sign for transaction size and number of tranches might be explained by a liquidity shortfall in financial markets. Commercial and industrial dummy variables became significantly and negatively related with credit spread, which means that, during the crisis period, issuers in the financial sector paid higher credit spreads than their counterparts in the commercial and industrial sectors. Finally, coefficients of the number of banks, EUSA5y-Libor3M, and other dummy variable became insignificant.

We completed our study by applying an organizational choice model to SF and SDF transactions. Our goal was to determine what affects the probability of a new borrower choosing between SF and SDF transactions, and even between PF loans and AS bonds or between AS and CB issues. In order to test the expected impact on the probability of a sponsor to choose SF over SDF, PF over AS, or AS over CB, we resorted to a generalized Tobit model, following Heckman (1979). We performed maximum likelihood estimation on our credit spread samples of our model specification (models [1a], [1b], and [1c]) simultaneously with a probit selection equation, where the probability of underwriting a loan or bond was a function of either micro and macro variables.

We found that: (1) borrowers chose an SF transaction when they are looking for long-term financing and when they operate in a higher risk country; (2) borrowers/issuers in industrial, utilities, transportation and government showed higher likelihood to choose SF transactions; (3) the probability of observing an SF transaction decreased with the tranche size and currency risk; (4) several macroeconomic factors significantly determined the selection of an SF transaction – among these, risk free rate, volatility, the slope of the Euro swap curve, and credit accessibility influenced positively the probability of observing an SF loan or bond over an SDF bond; and (5) the 2007/2008 financial crisis, as expected, decreased the probability of observing an SF loan or bond.

Considering the choice between PF and AS: (1) the coefficients of the industrial, utilities, transportation, and government dummy variables were positive; i.e., sponsors belonging to the financial industry were more likely to use securitization as a funding source; (2) a sponsor located in a higher risk country proved more likely to be financed with a PF loan than an AS bond; (3) the financial crisis, as expected, led to a transfer in the form of funding based on SF transactions, increasing the use of PF and reducing the use of AS; (4) the negative and significant coefficient for the currency risk dummy variable indicated that in the case of currency risk, AS is preferred; and (5) sponsors preferred AS bonds for larger tranches and when they sought funding with a higher time to maturity.

Finally, with respect to the choice between AS and CB, we concluded that: (1) AS was chosen when issuers are looking for longer-term sources of funding, are established in riskier countries and bonds face currency risk; (2) risk free rate, volatility, and the slope of the Euro swap curve, as expected, influenced positively the probability of observing an AS bond *versus* a CB; (3) again, and due to the relevant role played by securitization in the development and propagation of the 2007/2008 financial crisis, the crisis dummy variable was significantly negative; and (4) the unique sector that had a significant impact on the probability of observing an AS instead of a CB issue, was government.

7.3. Suggestions for Future Research

This study indicates clear avenues for further research. The effect of rating on PF loans credit spread could be researched further, because the available data on rating for PF transactions is scant, when compared with AS or CB issues. The same takes place with AS bonds. Perhaps the inclusion of a servicing fee, instead of management fee, might improve the results.

Further research could also explore the microeconomic features of PF associated contracts. With additional data on financial and nonfinancial contracts (e.g., operation and management agreement, construction agreement, off-taking agreement), as in Corielli et al. (2010), one might better understand how these contracts are linked to credit spread levels.

The effect of Basel III on AS bonds credit spread could be researched further. From a bank regulatory perspective, the originator is required, under new regulation from January 2011 onwards (Basel III), to retain at least 5% of the transaction for a funded securitization. In a synthetic securitization, the originator would equally keep the first-loss piece, by transferring only the risk of higher tranches – via credit default swaps (CDS) or similar instruments – to investors. Thus, it would be very interesting to understand the impact of the new requirements of Basel III on AS tranches credit spread.

Further research could also explore the impact of market liquidity on credit spreads for SF *vis-a-vis* SDF transactions, namely between AS and CB issues. Hu and Cantor (2006) argue that SF securities are less liquid than CB and that this has an impact on credit spreads. Gupta et al. (2008) examine the impact of liquidity on syndicated loan spreads. After controlling for other determinants of loan spread such as borrower, loan, syndicate and macroeconomic variables, they show that loans with higher expected liquidity – loans that are more likely to be traded on the secondary markets – have significantly lower spreads at the time of origination. The introduction of a proxy for market liquidity on our models could increase the adjusted R^2.

We found that the logarithm of maturity, included as an additional regressor in the models to test for the presence of any non-linear effects of maturity on credit spread for SDF and SF samples, is insignificant for AS bonds. However, based on the augmented component-plus-residual plot shown in Graph 6, we concluded that although not significant, there is a negative relationship between credit spread and maturity. We leave further empirical analysis of this question for future research, mainly with an underlying database with a higher number of observations.

Finally, our regression models did not include variables reflecting some specific characteristics of the borrowers in any direct way – such as borrower liquidity or leverage ratios – despite the likelihood that such variables would prove useful. There were two reasons for this. First, DealScan and DCM Analytics databases do not provide an identification code (i.e., Datastream identification number) for borrowers, so there is no feasible method of matching borrowers to their corresponding accounting or debt price data. Second, it is not at all clear that debt or liquidity ratios for PF and AS borrowers would be comparable to similar ratios for CB issuers. Whereas the issuer of CB is usually an operating company, the PF and AS borrower is, by definition, a vehicle company without external assets or sources of repayment. However, the extent to which any of these variables could have an impact on SF and SDF credit spreads remains to be explored.

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Annex 1: Securitization Instruments

In this annex we will be taking a close look at securitization financing deals. As there are so many different deals, spanning across many different asset classes as well as jurisdictions, we will look to the prominent classes of asset securitization transactions. The main objective of this annex is to analyze the basic characteristics and market structure of securitization activity and to answer the following questions: (1) What is securitization?; (2) How is the transaction structured?; (3) What is the role of each party involved in the securitization process?; (4) What are the main advantages (motivations) and disadvantages of securitization?; (5) What are the major tax, accounting, and legal issues?; and (6) How has the market for securitization changed after the 2007/2008 financial crisis?

Definition of Securitization

Generally speaking, the term securitization is used to represent the process whereby financial assets are pooled together, with their cash flows, and converted into negotiable securities to be placed into the market; i.e., it is a technique used to transform illiquid assets into securities.[395] As asserted by Fabozzi et al. (2006), securitization "*... refers to the sale of assets, which generate cash flows, from the entity that owns them to another entity that has been specially set up for the purpose, and the issuing of notes by this second entity. These notes* […] *are referred to as asset-backed securities.*" Asset securitization is thus a structured finance technique allowing for credit to be provided directly through market processes rather than through financial intermediaries – the so-called financial disintermediation.[396]

The key element of securitization is that the obligation of the issuer to repay investors is backed by the value of a pool of financial assets or credit support provided by a third party to the transaction. Contrary to the traditional secured bonds, where it is the ability

[395] When we refer to financial assets we mean, e.g., a loan, an account receivable or a note receivable. In a securitization transaction, the originator is using a pool of loans or receivables it owns as collateral for debt instruments that are issued. These financial assets are referred to as securitized assets.
[396] According to Jobst (2006a), "*[S]ecuritisation substitutes capital market-based finance for credit finance by sponsoring relationships without the lending and deposit-taking capabilities of banks (disintermediation).*"

of the originator (or issuer) to generate sufficient cash flows to reimburse the debt that determines the risks of the transaction, in securitization the source of repayments/funds shifts from the cash flows of the issuer to the cash flows generated by the securitized assets and/or a third party that guarantees the payments whenever cash flows become insufficient. This idea is corroborated by Vink and Thibeault (2008), which point out that the essential "*... element of an asset securitization issue is the fact that repayment depends only or primarily on the assets and cash flows pledged as collateral to the issue, and not on the overall financial strengths of the originator (sponsor or parent company).*" Therefore, before performing a transaction it is essential to evaluate the assets' characteristics, because they will affect (1) the creditworthiness of the related securities – represented by a rating assigned by a rating agency;[397] and (2) the type and magnitude of credit enhancement mechanisms necessary to improve the rating of the securities issued.[398]

The markets for the securities issued through securitization are composed of three main classes [Blum and DiAngelo (1997) and Choudhry and Fabozzi (2004)]: asset-backed securities (ABS), mortgage-backed securities (MBS), and collateralized debt obligations (CDOs). Securities backed by mortgages are called MBS, securities backed by debt obligations are called CDOs, and securities backed by consumer-backed products – e.g., car loans, consumer loans, and credit cards – are called ABS.

According to Jobst (2006a), asset-backed securities are issued "*... as subordinated, negotiable contingent claims ('tranches') with varying seniority and maturity, backed by the credit payment performance of securitised assets (integration and differentiation process).*" These tranches represent different risk-return profiles, with the underlying reference portfolio to be allocated among the various tranches through prioritized contractual repartitioning. Fabozzi et al. (2006) present the following issuers of asset-backed securities: (1) captive finance companies of manufacturing firms that provide financing only for their parent company's products; (2) financing subsidiaries of major industrial corporations; (3) independent finance companies; and (4) domestic and foreign commercial banks. With regard to banks, securitization technique allows the

[397] See Krebsz (2011) for further discussion of the issues addressed by rating agencies when rating a particular transaction.

[398] See Annex 6 for further discussion of structured finance and special purpose vehicles.

transformation of heterogeneous assets that are mostly not negotiable into liquid and homogenous securities, suitable for trade. The range of assets that can be securitized by banks is very wide and includes mortgage loans, credit card receivables, bonds, auto loans, and loans to small and medium-sized enterprises (SMEs), among others.

The Typical Securitization Transaction Scheme

As pointed out, a securitization transaction is implemented through a transfer of assets from the originator to an SPV, which then issues securities, in the form of debt instruments, to be placed into the market through a private or public offering. Exhibit 1 presents a graphic representation of the fund flows in a typical securitization transaction.

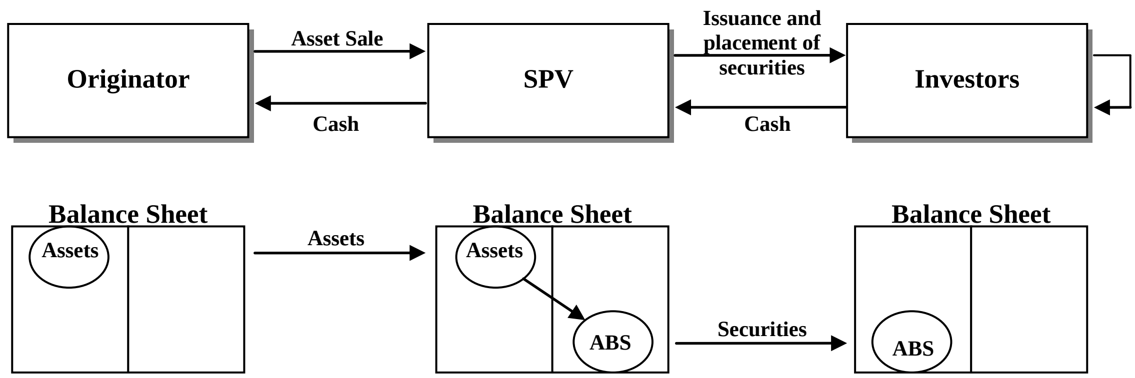

Exhibit 1: Fund flows in a securitization transaction.
Source: Adapted from Roever and Fabozzi (2003) and Tasca and Zambelli (2005).

The exhibit shows the two basic deals involved: (1) asset sale; and (2) the issuance of securities (considering ABS in this case). For example, if a bank intends to raise money by selling a specific pool of loans through securitization, it is possible to identify the subsequent fund flows during the life of a securitization transaction: (1) the bank (originator) sells the assets to a separate entity (SPV); (2) the SPV transforms them into negotiable securities to be placed into the capital market; (3) the issuance of securities (usually debt obligation instruments) – backed by the acquired assets – in order to finance the asset purchase; and (4) the cash flows originated by the acquired pool of assets are then used to pay the principal and interest of the securities to the final investors.[399]

According to Davidson et al. (2003) "*[T]he standard structure for securitization in Europe is somewhat different from U.S. 'pass-through'.*" In the U.S. trusts play an important role. They own assets such mortgage loans, and investors have a direct ownership interest in the trust. In Europe, all deals use a variant of the following structure: (1) the originator sells the assets to an SPV; and (2) the SPV then issues a bond, which is purchased by various investors, backed by the assets owned by the SPV. This vehicle company is usually a company subject to corporate law, but restricted in activity, and may be exempted from certain taxes.[400] But in Europe, as in any other part of the world, the securitization process involves a standard set of analysis prior to the issuance of securities, namely: (1) assessing the collateral – i.e., understanding the collateral; (2) modeling cash flows; (3) quantify risk factors via stress tests or other techniques;[401] and (4) structuring the transaction – having in mind several factors, such as the client's wishes, the type of assets, the opinion of the rating agencies, the availability of data, and the investor attraction for the deal.[402]

In order to understand the whole securitization process, Exhibit 2 describes the major steps required to accomplish a typical securitization transaction.

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[399] The cash collection related to the securitized portfolio is managed by a third party, the Servicer, which receives a servicing fee. Servicing involves collecting cash from borrowers, notifying borrowers who may fail, and, when necessary, recovering and disposing of the collateral if the borrower does not make loan repayments by a specified time.

[400] As asserted by Davidson et al. (2003), this type of structure "*... can be much more costly than a U.S. trust company because in continental Europe it is very common to have a minimum amount of share capital necessary to set up a company.*" For example, in Belgium, the minimum is Euro 62 thousand, in the Netherlands Euro 20 thousand, and in Portugal Euro 250 thousand (applied to 'Sociedades de Titularização de Créditos') – that is the reason why most securitization transactions occurred through old offshore vehicles or structures. The U.K. tends to be the most popular jurisdictions for SPVs, as well as Ireland, because there is no minimum share capital necessary.

[401] Generally speaking, the idea is to try to determine, based on historical loss and default statistics, a stress on the cash flow that is commensurate with a rating level.

[402] Structuring the transaction requires to deal with the following issues: (1) timing; (2) risk; (3) credit enhancement and rating; (4) legal process and counterparties – collateral arrangements, counterparty arrangements, bond description, legal opinions, and rating letters –; and (5) costs.

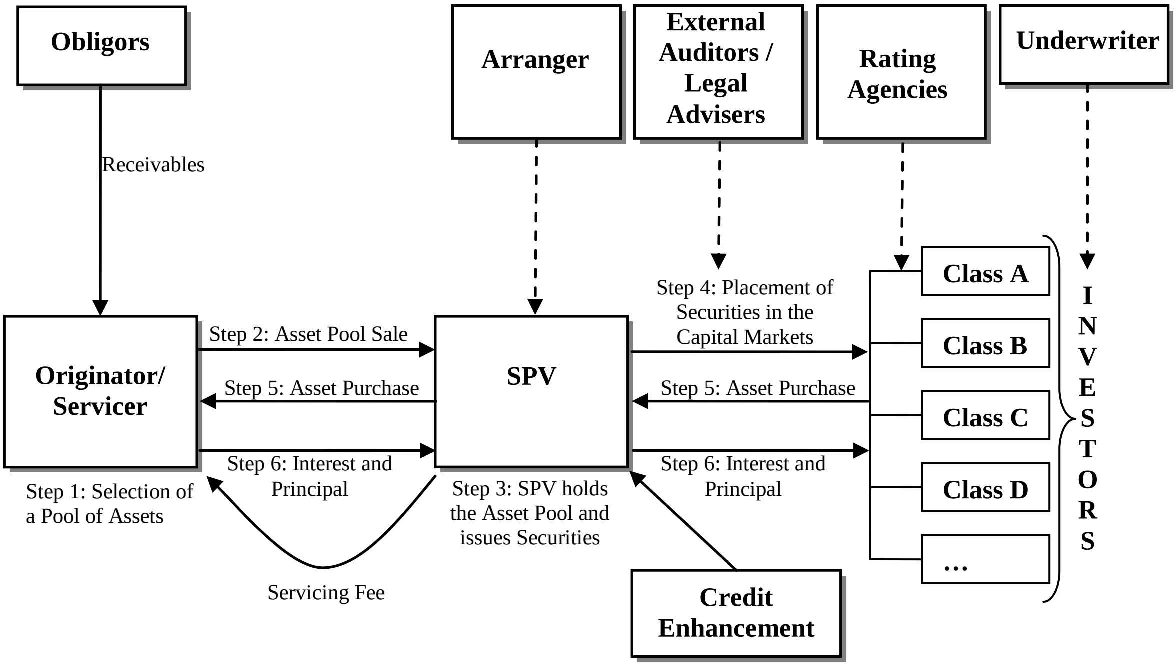

Exhibit 2: Basic securitization process.
Source: The author.

Step 1: the originator identifies a pool of assets (receivables) that satisfy certain features that make them acceptable to be securitized;[403] Step 2: the pool of assets is transferred to an SPV at par value and based on a true sale transaction;[404] Step 3: the SPV holds the asset pool, paying for it by issuing securities;[405] Step 4: securities are offered to capital markets and structured into different classes;[406] Step 5: payment of the asset purchase;[407] and Step 6: the originator – who has proximity with the borrowers and

[403] The originator typically identifies assets with similar characteristics. Theoretically, any asset producing regular cash flows (e.g., residential and commercial mortgages, credit card receivables, etc.) can be securitized.

[404] True sale or mutually exclusive use of asset pool's cash flows means that the originator would not have any direct claim on the receivables, nor would the investors in the securities issued by the SPC or the SPV itself have any claim against the general assets of the originator.

[405] To finance the acquisition of the assets, the SPV issues securities sold to investors in the capital markets. The credit rating of those securities will be based solely on the strength of the asset pool. The issued securities may be senior and junior, or they may be senior, mezzanine, and junior, or they may have various classes, such as class A, class B, class C, and so on. These various classes are created in order to generate differential interests in the pool, such that the senior investors have superior rights over the pool than the subordinated investors.

[406] The SPV sells securities in the capital markets through a private placement or public offering, with the help of underwriters. These securities are usually purchased by banks, insurance companies, pension funds and other institutional investors.

[407] The funds raised by the SPV from the market placement are used to pay the pool of assets originally acquired by the vehicle.

typically has an infrastructure and systems in place for doing so – collects cash flows related to the assets (interest and principal); i.e., retains the servicing function.[408]

The highest rating for Class A (the most senior class) is explained by two factors: (1) segregation of the assets from bankruptcy risks of the originator; and (2) the implementation of different credit enhancement strategies. One strategy is the creation of a credit risk mitigation device by subordination of Classes B, C, D, …, such that those lower classes provide credit support to Class A. It is possible to say that the size of classes B and C has been determined as to meet the rating objective for Class A. Likewise, the size of Class C has been determined as to have Class B accorded the desired rating. In other words, the entire transaction is structured to meet specific investor needs. That's why, in a narrow sense, the term structured finance is used almost interchangeably with securitization.[409]

Different credit enhancement mechanisms may be necessary to improve the credit rating of the issued securities and reduce the risks transferred to investors; i.e., credit enhancement serves to protect investors from the risk of collateral not being repaid as expected.[410] These mechanisms can be either internally determined within the transaction structure – internal credit enhancement mechanisms – or externally provided by a third party – external credit enhancement mechanisms. The issuer should examine the various mechanisms of credit enhancement prior to issuance, to determine the most effective combination of credit enhancement mechanisms. As referred by Fabozzi et al (2006), "*... the reason why an issuer does not simply seek a triple-*A *rating for all the securities in the structure is that there is a cost to doing so* […] *In general the issuer, in deciding to improve the credit rating on some securities in a structure, will evaluate the tradeoff associated with the cost of enhancement versus the reduction in yield required to sell the security.*" External credit enhancement mechanisms are provided by third-

[408] The servicer collects the cash associated with the acquired assets and forwards these cash flows to the trustee, receiving a servicing fee. In the end, the trustee forwards these payments to the final investors. Servicing activities can be implemented by the originator, a subsidiary of the originator or a separate servicer. According to Tasca and Zambelli (2005) "*[R]egarding the securitization process initiated by big-size corporate, the Servicer activity is usually done by a separate financial institution, who takes care of all collection activity. Small-medium size firms, on the other hands, usually sign a contract of sub-service with a financial institution, acting as a primary servicer.*"

[409] See Fabozzi and Kothari (2007) for further discussion of the process of creating different classes or tranching.

[410] See, for example, Roever and Fabozzi (2003) and Fabozzi and Kothari (2007) for an in depth description of internal and external credit enhancement mechanisms.

party guarantees, granting for first-loss protection against losses up to certain amount. Examples are: (1) guarantees; (2) letters of credit;[411] and (3) bond insurance.[412] This kind of guarantee can either apply to all the issued tranches or, more typically, only to one particular tranche. Moreover, internal credit enhancement mechanisms are: (1) subordination;[413] (2) overcollateralization;[414] (3) cash reserve accounts;[415] (4) excess spread;[416] (5) trigger events; and (6) minimum debt or interest service coverage levels. The type and amount of credit enhancement employed in a transaction represents the matching point of the issuer's need to maximize deal proceeds and the rating agencies' judgment with respect to how much credit enhancement is required to achieve the desired rating on the senior bond classes.[417] According to Roever and Fabozzi (2003) one important difference between the approach used to rate securitized debt and bonds "*... is that corporate obligations are rated ex post while securitized products are rated ex ante* […] *ABS generally are structured with the idea of issuing securities that meet a specific rating profile.*" Thus, rating agencies play a critical role in the process.

[411] It is a financial guarantee through which a bank becomes committed to reimburse credit losses up to a predetermined amount.

[412] Also called a surety bond, a bond insurance is a financial guarantee from an insurance company, commonly called monoline insurance company [e.g., Ambac Assurance Corporation (AMBAC); Financial Guaranty Insurance Corporation (FGIC); Financial Security Assurance (FSA); Municipal Bond Insurance Corporation (MBIA); and XL Capital Assurance]. The guarantee provided is for the timely payments of principal and interest if these payments cannot be satisfied from the cash flow from the underlying loan pool.

[413] Issuers can increase their advance rates by selling additional bonds of lesser credit quality, which are subordinated in payment priority to the senior bonds issued from the structuring. Subordinated tranches will absorb collateral losses for the benefit of senior bonds. Structuring the transaction means that: (1) rating agencies consults with the issuer and its investment bank regarding the optimal capital structure; (2) investment bank gauge market demand for particular types of risk, attempting to determine what average lives and what credit ratings are most saleable; and (3) given a proposed capital structure, the rating agencies determine how much enhancement is needed for each class of bonds.

[414] The overlying bonds are lower in value compared to the underlying asset pool: for example, Euro 250 million nominal of assets are used as backing for Euro 200 million nominal of issued bonds.

[415] Usually from part of the debt proceeds, a cash reserve is maintained in a account and used to cover initial losses.

[416] The excess spread results from the positive difference between cash inflows from assets and the interest service requirements of liabilities. It acts as the first line of credit support for the deal and if losses are low, the excess spread will increase.

[417] Referring to the level of enhancement needed for a particular transaction, Fabozzi et al. (2006) posit that "*[T]ypically, securitizations where underlying credit performance is historically strong utilize senior/subordinated structures, since the credit enhancement required is relatively small and the senior/subordinate structure offers efficient execution. Deals backed by lower-quality loans require higher levels of enhancement, and typically utilize a combination of the above-mentioned credit enhancement forms.*"

A central and defining characteristic of securitization is that the cash flows generated by a company's financial assets can support one or more securities that may be of higher credit quality then the company's secured debt. To achieve this higher credit quality, the securities used to fund the securitization rely on the cash flow created by the assets – or guarantee by a third party – rather than on the payment promise of the company. Regarding the securitization financing structure, there are two essential characteristics to be highlighted. The first concerns to the SPV, which represents a critical player within the process. Secondly, the transaction is realized through a 'true sale' of assets by the originator to the SPV. The 'true sale' mechanism allows a company to isolate a group of financial assets, separating their risk from the firm.[418] Therefore, the expected return to investors relies mainly on the risk of the cash flows guaranteed by the pool of assets, rather than the default risk of the originator.[419] The SPV role is critical and provides an investor with greater protection. With the separate incorporation of the SPV – which is intended to isolate the assets – the assets are no longer available to the originator or its creditors.[420] Furthermore, the SPV activity is strictly limited to holding the asset pool and issue in turn securities backed by these assets; i.e., the SPV is not allowed to perform other business activities and to assume other obligations.

Financial intermediaries play a crucial role within the securitization process, which includes the following activities: (1) identification of homogeneous financial assets to be securitized; (2) identification, together with the credit agency (or credit agencies when necessary), of the financial structure of the securities; (3) if the credit rating analysis is positive, the arranger writes a pre-sale report (and external auditors implement a due diligence of the asset portfolio); (4) in line with legal firms, the legal

[418] Contrary to U.S., in Europe, in many jurisdiction (e.g., Germanic type of law), there is a sale or assignment of the assets to a SPV but the perfection of the sale is often postpone until various trigger events occur in order to avoid complicated borrower notification laws. See Davidson et al. (2003) for further discussion of European securitization legislation.

[419] In order to protect final investors against the bankruptcy risk of the originator, it is necessary to structure the transaction as 'true sale' of assets between the originator and the SPV (a third party established exclusively as a vehicle to accomplish a securitization transaction).

[420] Although the remoteness from bankruptcy may be achieved ensuring independence of the SPV from the originator, "*... in practice this has been thrown somewhat into doubt during the credit crisis as the true sale status has been challenged in some federal courts in the U.S.*" [Roever and Fabozzi (2003)]. Originators need to ensure carefully that the assets transferred to the SPV are ring-fenced from further originator interaction and have to analyze cautiously if any structural feature of the transaction may threaten the true sale claim.

contracts are developed (e.g., transfer agreement, indemnity and warranty agreement, corporate services agreement, servicing agreement, cash management agreement and collateral management agreement, trust deed, deed of pledge, and subscription agreement); (5) planning of marketing activities, including a road show aimed at presenting the transaction characteristics to institutional investors; and (6) issuance and placement of the securities in the primary market.[421] The next phase in the process is the acquisition of the securities by investors.[422]

Securitization Structures

Tasca and Zambelli (2005) split securitization transactions into two main types: (1) cash flow based (CFB) securitization or funded securitization – structured as a sale of assets by a company (originator) to a special entity (SPV), which then issues securities backed by the underlying assets;[423] and (2) synthetic securitization – structured in such a way that the credit risk associated with a pool of assets is transferred to a separated entity (SPV).[424] As in synthetic securitization there is no sale of assets, the originator does not receive any cash flow and the SPV is not the owner of the pool of assets, but rather the entity carrying the associated credit risk.[425]

Exhibit 3 provides an overview of the main securitization instruments. Funded securitizations include three main categories: (1) Mortgage-Backed Securities (MBS); Asset-Backed Securities (ABS); and (3) cash flow Collateralized Debt Obligations

[421] Usually a offering circular has to be design to provide information to investors. The underwriter works together with the SPV to place securities in the primary market and usually ensures to the originator the acquisition of those securities that may remain unsold.
[422] It is important to notice that interest rate derivatives play an important role in securitization transactions for hedging and yield enhancement. The most commonly used interest rate derivatives are interest rate swaps, interest rate caps, and interest rates corridors. See, e.g., Fabozzi et al. (2005) for further discussion of this subject.
[423] In a so-called true sale securitization, the underlying assets are indeed actually sold by the originator to the SPV and thus removed from the balance sheet of the originator.
[424] See, among others, Krebsz (2011) for further development on advantages and disadvantages, financial benefits, regulatory issues, and operational differences between funded and synthetic transactions.
[425] This is realized through the use of derivatives like total return swaps and credit derivatives. A credit derivative is a derivative contract used to transfer credit risk on a reference entity or reference obligor between a credit protection seller that is short the credit risk, and a credit protection buyer that is long the credit risk. The most widely used credit derivative is the credit default swap (CDS) that is a bilateral contract between the protection buyer that is short the credit risk and the protection seller that is long the credit risk.

(CDOs).[426] In practice, CDOs can be classified either as funded securitization, synthetic securitization or a hybrid form incorporating elements of both.[427] In this dissertation, a cash flow CDO is a form of a funded securitization and a synthetic CDO a form of a synthetic securitization, because synthetic CDOs are much more specific instruments to transfer credit risk from one party to another.[428]

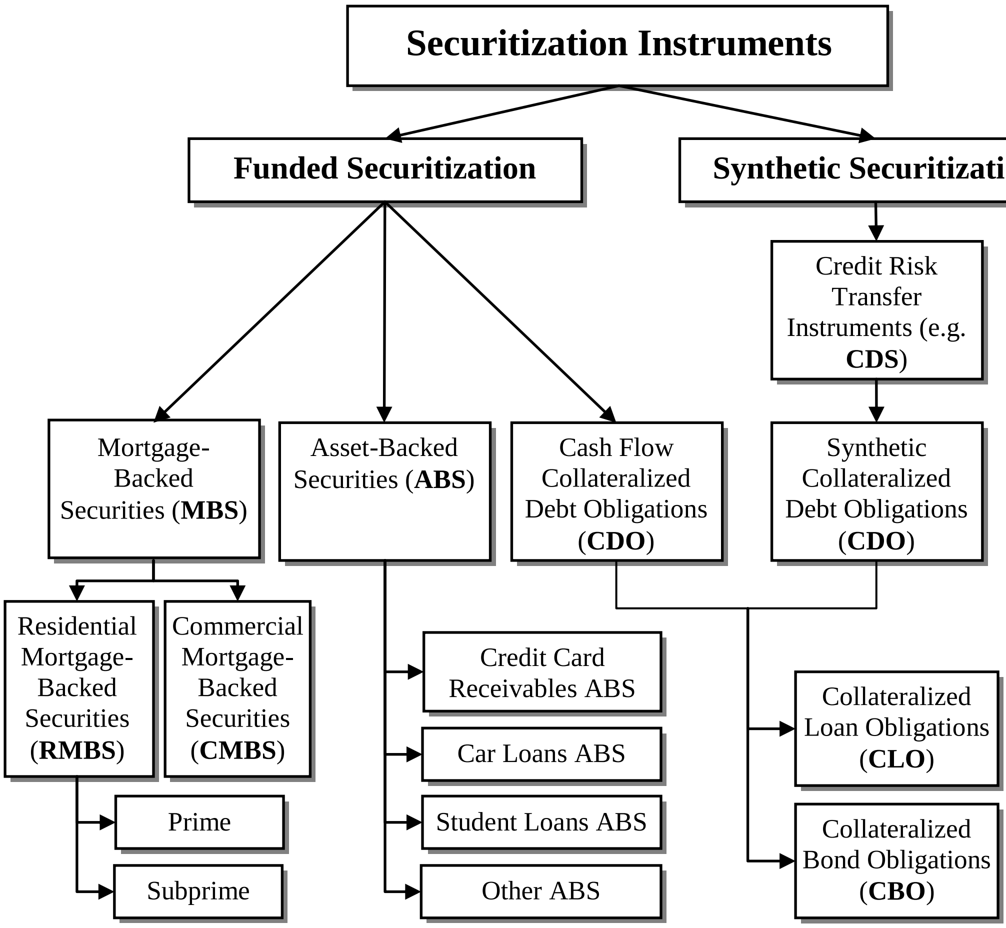

Exhibit 3: Securitization instruments.
Source: Adapted from Criado and Rixtel (2008).

[426] See, among others, Jobst (2003 and 2006b) and Vink and Thibeault (2008) for further discussion of this subject. Criado and Rixtel (2008) present a enlightening description of each type of securitization instruments. In practice, when the term ABS is used, it means asset-backed securities with the exception of MBS and CDOs.
[427] See, among others, IMF (2008a) and Duffie (2008).
[428] According to Criado and Rixtel (2008) different types of securitization instruments played different roles in the 2007-2008 financial turmoil. The ones most involved were short-term Asset-Backed Securities (or asset-backed commercial paper – ABCP), subprime RMBS and CDOs both cash flow and synthetic. Additionally, other instruments such as CDS were involved indirectly in the turmoil and provided useful information on the development of the financial market tensions.

From a bank regulatory perspective, the originator is required, under new regulation from January 2011 onwards (Basel III), to retain at least 5% of the transaction for a funded transaction. In a synthetic transaction the originator would equally keep the first-loss piece, by transferring only the risk of higher tranches – via credit default swaps (CDS) or similar instruments – to investors.

Given the important role played by CDOs in the 2007/2008 financial turmoil, we carried out a more detailed analysis of such structures.

CDOs, first introduced in 1988, are a type of securitization in which an SPV issues bonds or notes backed by cash flows of an underlying pool of assets. According to Fabozzi et al. (2006) "*[T]hese assets include one or more of the following types of debt obligations: investment-grade and high-yield corporate bonds; emerging market bonds; residential mortgage-backed securities (RMBS); commercial mortgage-backed securities (CMBS); asset-backed securities (ABS); real estate investment trusts (REIT) debt; bank loans; special-situation loans and distressed debt; and other CDOs.*"[429]

As for ABS and RMBS, CDOs can also be divided into two main types: (1) cash flow CDOs – backed by a pool of cash-market debt instruments; and (2) synthetic CDOs – investors have economic exposures to a pool of debt instruments, but this exposure occurs via a credit derivative rather than the purchase of the cash-market instruments. Cash flow CDOs are designed to split the credit risk of the underlying pool of assets into various tranches, each of which with a different credit exposure from the other. Thus, the notes issued have different risk profiles as a result of their relative subordination – that is, the notes are structured in a descending order of seniority – and the utilization of additional credit enhancement mechanisms.

Contrary to cash flow CDOs deals, synthetic CDOs are engineering so that the credit risk of the assets is transferred synthetically – rather than by a true sale – by the sponsor to investors, by means of credit derivatives instruments. Using this approach, underlying or reference assets are not necessarily moved off the originator's balance

[429] When the underlying pool of debt obligations consists of bond-type instruments is referred as collateralized bond obligation (CBO). When the underlying pool of debt obligations is a bank loan, a CDO is referred to as a collateralized loan obligation (CLO).

sheet, so it is adopted whenever the primary objective is to achieve risk transfer rather than balance sheet funding.[430]

A specific type of CDOs are Multisector CDOs, also known as ABS CDOs, ABS of ABS, CDOs squared (CDOs^2), or CDOs cubed (CDOs^3). According to Tavakoli (2008) Multisector CDOs "*... appeared in 1999 in response to investors' desire to securitize their own positions of structured product. Both balance-sheet and off-balance-sheet arbitrage deals have been done.*" These products were used and misused in a way that complexity masked the risk. For example, in a Multisector CDO including subprime collateral, one can find subprime mortgage loans, subprime auto loans, credit card receivables, and mezzanine corporate loans backing mezzanine tranches of CDOs used as collateral in a CDOs^2. Thus, "*[T]hese deals are nearly impossible for sophisticated investors to fairly value…*" [Tavakoli (2008)].

<u>Advantages and Disadvantages of Securitization Transactions</u>

The Modigliani and Miller (1958) capital structure irrelevance theorem holds that capital structure is irrelevant to firm value. Financial transactions, such as securitization, would not exist as it would offer no advantages over less costly alternatives. Considering that in the real world there are a plethora of different capital structures and securitization has been one of the principal means by which firms create their capital structures, securitization largely affects the value of the firm.

According to Hill (1996) securitization can help to reduce real-world costs, like regulatory costs and information costs.[431] Information costs reduction seems largest for firms who face severe 'lemons problems' [Akerlof (1970)] – available information about such firms is limited, unfavorable, or particularly difficult to appraise. As asserted by Hill (1996), securitization offers a low cost and credible way for information about

430 See, among others, Fabozzi et al. (2006), Lancaster et al. (2008), and Tavakoli (2008) for further discussion of CDOs deals, namely on the difference between cash flow structures and synthetic securitization vehicles.

431 For example, Pavel (1986), Cumming (1987), Pavel and Phillis (1987), Penacchi (1988), and Flannery (1989) suggest that banks use securitization because of high costs of traditional intermediation due essentially to capital requirements and a more competitive environment.

the firm's receivables to be produced and provided to investors.[432] Similarly, Iacobucci and Winter (2005) argue that "*... asset securitization is driven by the propensity of the market to allocate assets to investors who are best informed about asset values.*"

It is possible to identify three major explanations for securitization in the literature: (1) signaling; (2) prevent underinvestment; and (3) using comparative advantage. Regarding signaling, Greenbaum and Thakor (1987) develop a signaling model to explain how projects suffering from informational asymmetries can be financed through securitization. These authors argue that private information about the originated assets would induce financial institutions to prefer the securitization of better quality assets to mitigate their regulatory capital requirements for 'overcharged' asset exposure, whilst worse quality assets are retained.[433] DeMarzo (2005) develops a model in which informed financial intermediaries with superior information about asset valuation enhance their returns on capital by tranching their pools of assets based on specific risk characteristics. The same line of reasoning is presented by Pais (2009), which assert that "*... poor performing risky institutions or institutions with high information asymmetries are more likely to engage in securitisation.*"

With regard to agency costs, securitization may redress conflicts of interest between creditors and shareholders in the capital structure choice, concerning possible agency costs from underinvestment [Myers (1977, 1984)] and asset substitution [Jensen and Meckling (1976)] due to excessive levels of debt or the presence of non-value maximizing investment behavior, respectively.[434]

Regarding comparative advantages, Berger and Udell (1993) argue that the 'monitoring technology hypothesis' of securitization allows companies to obtain technological gains from specializing in niches of comparative advantage (which suggests economies of scale in those activities). This idea is corroborated by Thomas (2001), which states that

[432] Additionally, Hill (1996) argues that securitization may increase the future cash inflows of a firm due to (1) effects of specialization in receivables' origination and retention – economies of scope; (2) agency costs reduction; and (3) regulatory costs reduction.
[433] This idea is corroborated by Ambrose et al. (2005) who find that, similar to Calem and LaCour-Little (2004) and DeMarzo and Duffie (1999), lower risk loans tend to be securitized.
[434] Using optimal risk allocation models, Benveniste and Berger (1987) and James (1988) show that securitization can improve risk sharing and increase project funding by avoiding the Myers (1977) underinvestment problem. See Jobst (2006a) for further discussion of this subject.

"*... securitization allows companies – FIs as well as non-FIs – to specialize on the activities of their comparative advantage.*"

The rationale for the emergence of securitization transactions should be found in the economic advantages of: (1) increased liquidity and funding [e.g., Roever and Fabozzi (2003),[435] Jobst (2006a),[436] and Krebsz (2011)[437]]; (2) reduction of the cost of funding [e.g., Goldberg and Rogers (1988), Davidson et al. (2003),[438] Roever and Fabozzi (2003), Jost (2006), Fabozzi and Kothari (2007), and Fabozzi et al. (2006)];[439] (3) allowing originators to reach a funding sources diversification [e.g., Davidson et al. (2003), Roever and Fabozzi (2003), Fabozzi and Kothari (2007), and Krebsz (2011)];[440] (4) improving originators' risk management [e.g., Cumming (1987), Goldberg and Rogers (1988), Rosenthal and Ocampo (1988),[441] Davidson et al. (2003), Jobst (2006a), and Fabozzi and Kothari (2007)]; (5) increasing the segmentation between the

[435] Roever and Fabozzi (2003) refer to securitization as a reliable and relatively unconstrained source of off-balance sheet financing that mitigates traditional funding constrains and can promote a company's growth.

[436] As referred by Jobst (2006a), securitization "*... allows issuers to raise funds and improve their liquidity position without increasing their on-balance sheet liabilities and capital base in a bid to refinance asset origination or investments…*"

[437] Krebsz (2011) points out that "*[T]he credit crisis with its far-reaching implications for the global financial markets has put the liquidity and funding strategy on the top of the agenda of most banks and financial institutions.*" Although securitization has played an relevant role in the development and propagation of the financial crisis, it also allowed financial institutions to solve liquidity and funding problems in the post-crisis period, namely as an active tool to access various lending schemes (SLSs) by central banks around the world.

[438] According to Davidson et al. (2003) "*... firms with high-quality assets may be able to reduce their financing costs through securitization.*" This happens when bonds created through securitization have a higher credit rating or are otherwise perceived to have less risk than the originator's general obligations.

[439] If a corporation wants to issue bonds collateralized by a pool of assets it probably will have the same funding cost as if it issues a corporate bond. But if the company creates another legal entity (SPV) and sell the assets – in a way that if the company is forced into bankruptcy (there is a 'true sale') its creditors cannot try to recover the financial assets because they are legally owned by the SPV – to that entity who issue bonds backed by those assets, investors interested in buying the bonds will evaluate the credit risk of the assets. Additionally, the SPV will show the characteristics of the collateral to a rating agency which evaluates the credit quality of the collateral and inform the issuer what must be done to obtain a desired credit rating. In this case, the issuer must be asked to 'credit enhance' the structure. Basically, rating agencies looks at the potential losses from the collateral and make a determination of how much credit enhancement is needed for the bond classes issued to achieve the ratings targeted by the issuer. Thus, the company can obtain funding using its assets to achieve a better credit rating for the bonds issued than otherwise will be obtained if the company will chose to issue corporate bonds – with enough credit enhancement, it can issue a bond with a rating triple A.

[440] Once an originator is well established in the asset-backed securities market it can look at both the corporate bond market and the asset-backed securities market when assessing its best funding source.

[441] Rosenthal and Ocampo (1988) argue that "*... securitization transactions manage these risks* [credit, interest rate, and prepayment risks] *more explicitly, and therefore more efficiently, than does conventional lending* [… and…] *it makes these risks more transparent and it also allocates them far more precisely to the players who are best able to absorb them.*"

origination and investment functions [e.g., Davidson et al. (2003)]; (6) allowing originators to benefit from regulatory and/or tax arbitrage [e.g., Cumming (1987), Jones (2000), Davidson et al. (2003), and Krebsz (2011)];[442] and (7) allowing originators to improve key financial ratios [e.g., Goldberg and Rogers (1988), Roever and Fabozzi (2003), Fabozzi and Kothari (2007), and Krebsz (2011)].[443]

It is possible to discuss the main motivations for securitization from both the perspectives of a nonbank corporation and a bank corporation.[444] According to Fabozzi et al. (2006) the principal reasons a nonbank corporation may elect to issue an asset-backed security are: (1) to reduce funding costs; (2) to diversify funding sources; and (3) to accelerate earnings for financial reporting purposes.[445] Looking to bank corporations, the literature presents four main motivations behind securitization: (1) the need for new sources of funding – alternative to raising deposits [e.g., Goldberg et al. (1988), Estrella (2002), Fabozzi et al. (2006), Loutskina and Strahan (2009), and Cardone-Riportella et al. (2010)];[446] (2) risk management and the transfer of credit risk, to fund risky financial assets and minimize financial distress costs [e.g., Goldberg et al. (1988), Fabozzi et al. (2006), Jobst (2006a),[447] and Cardone-Riportella et al. (2010)];[448]

[442] One of the major economic drivers of a new securitization transaction is Basel II (and ongoing forward Basel III). The applicable calculation rules (e.g., standardized approach vs internal ratings-based approach vs advanced ratings-based approach) highly influence the regulatory capital charge.

[443] According to Goldberg and Rogers (1988) "*... if the transaction is considered a sale of assets, firms can realize a gains (or a loss) upon sale, thereby accelerating income recognition.*" Furthermore, by removing assets from balance sheet, securitization can improve a company's return on assets and return on equity ratios. The same line of reasoning is presented by Roever and Fabozzi (2003), Fabozzi and Kothari (2007), and Krebsz (2011).

[444] According to Jobst (2006a), the more pertinent advantages of securitization enjoyed by financial institutions are: (1) the reduction of economic cost of capital (economic motive) and regulatory minimum capital requirements (regulatory motive); (2) the diversification of asset exposures (hedging motive); and (3) the recognition the gains (or losses) within the moment of the true sale of the asset pool. Moreover, the reduction of agency costs that arise from asymmetric information (e.g., underinvestment and asset substitution) and the asset-liability management improvement "*... are particularly instrumental to the efficient capital management of non-financial corporate issuers.*"

[445] Similarly, Lupica (1998) presents the following motivations for a nonbank corporation to choose securitize its assets: (1) improving liquidity; (2) increasing diversification of funding sources; (3) lowering the effective interest rate; (4) improving risk management; and (5) achieving accounting-related advantages.

[446] Fabozzi et al. (2006) argue that "*[B]anks can use securitization to (1) support asset growth, (2) diversify their funding mix and reduce cost of funding, and (3) reduce maturity mismatches.*" Securitization enables banks to reduce their funding costs because most of the notes issued by SPVs are higher rated than the bonds issued directly by the originating bank itself.

[447] As pointed out by Jobst (2006a), securitization "*... is one operational means of risk management, which allows issuers to reallocate, commoditise and transfer different types of risks (e.g., credit risk, interest rate risk, liquidity risk or pricing risk) to capital market investors at a fair market price.*"

(3) the search for new profit opportunities, by recognizing accounting gains when the market value of loans exceed their book value [e.g., Flanery (1989) and DeMarzo (2005)]; and (4) the adjustment of capital ratios [e.g., Donahoo and Shaffer (1991), Berger and Udell (1993), Jagtiani et al. (1995), Carlstrom and Samolyk (1995), Berger et al. (1995), Jones (2000), Calomiris and Mason (2004), Ambrose et al. (2005), and Fabozzi et al. (2006)].[449]

Fabozzi et al. (2006) present the benefits of securitization from the perspective of investors. Securitization transactions allow investors to diversify sector interest, access different risk-rewards profiles, and access sectors that are otherwise not open to them. Thus, the key benefit to investors is the ability of securitization to tailor risk-return profiles.[450] This idea is corroborated by Jobst (2006a), who states that "*[I]nvestors of securitized debt can quickly adjust their investment holdings at low transaction costs in response to a change of personal risk sensitivity, market sentiment or consumption preferences.*" Krebsz (2011) presents diversification, additional protection mechanisms, the ability to address different type of investors, wider pricing, and rating stability as the main advantages of asset securitization in the perspective of investors.

Although all of the above-mentioned advantages, securitization also has disadvantages, especially when used inappropriately. Asset securitization transactions are fairly complex and involve a significant amount of due diligence, negotiation, and legal activities. As asserted by Davidson et al. (2003), "*[A] first transaction from an*

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[448] Cumming (1987) and Flannery (1994) argue that banks with a higher share of risky loans may securitize more. Contrary, Greenbaum and Thakor (1987), Kohen and Santomero (1980), Kim and Santomero (1988), Flannery (1989), and Blum (1999) argue that banks could have an incentive to securitize high-quality loans and to retain low-quality loans. Thus, securitization leads to an improvement in the management of interest rate and credit risks [Hess and Smith (1988), and Rosenthal and Ocampo (1988)] if the originator securitizes its worst assets. However, securitization may also increase the level of risk if the bank securitizes its better assets [Murray (2005)].

[449] The use of securitization to reduce banks' capital requirements involves exploiting the opportunity to arbitrage the regulatory capital required under the Capital Accord of 1998 – Basel I [see, e.g., Jones (2000)]. Basel II agreement, which came into effect in 2008, remedies some of the weaknesses of the Basel I Accord. As pointed out by Cardone-Riportella et al. (2010), with Basel II agreement, "*... the possible reduction in the capital requirements is closely associated both with the quality of the underlying portfolio and with the amount of risk exposure retained by the originator entity, which prevents the possible arbitrage of capital.*"

[450] Hill (1996) argues that securities issued in a securitization transaction "*... can have a risk and reward configuration the investor otherwise could have obtained only by acquiring, at higher cost, several securities.*"

originator can take anywhere from 1 to 2 years to complete […] Securitization is quite costly in terms of up-front and ongoing fees compared to other types of financing."[451] This idea is corroborated by Cardone-Riportella et al. (2010), which point out that the disadvantages of securitization include the fixed costs of setting up the SPV and a potential reduction in the flow of tax benefits from keeping the assets in the balance sheet and financing them with debt. Similarly, Jobst (2006a) presents the structural complexity of securitization as the main driver for the major concerns about this type of structured finance, which are: (1) high accumulation of interest rate risks; (2) the potential for errors in the rating and pricing of complex security designs; and (3) the shortcomings of analytical models for assessing risks.

The credit crisis of 2007/2008 has somewhat tarnished the positive image prevailing of the positive role played by securitization in dispersing credit risk, thereby enhancing the resilience of the financial system to default by borrowers.[452] Linking singular credit facilities to the aggregate pricing and valuation discipline of capital markets, securitization was expected to help remedy deficiencies in financial markets arising from incomplete capital allocation. But the collapse of the securitization market and the ensuing market turbulence have cast serious doubt on this economic proposition of unbundling, transforming, and redistributing credit risk via structured finance instruments.[453] As pointed out by Shin (2009), "*[I]n its place, there is a new received*

[451] According to Davidson et al. (2003) for a Euro 100 million transaction developed in Europe, "*... these costs add to the overall financing costs anywhere from about 15 to 50 basis points, assuming a 7-year bullet financing.*" As these costs are essentially fixed, the larger the transactions, the lower is the impact on the final funding level.

[452] See, among others, BIS (2008), IMF (2008b), Benmelech and Dlugosz (2009), Brunnermeier (2009), and Demyanyk and Van Hemert (2011) for further description of the credit crisis and the role played by asset securitization.

[453] Jobst (2009) posits the following main drivers of the financial crisis: (1) low interest rates which fostered mortgage lending and the expansion of house supply; (2) mortgage brokers and banks rely heavily on securitization to refinance themselves; (3) the availability of cheaper credit resulted in a general deterioration of lending standards – the off-balance sheet treatment of securitization allowed originators to accept marginal borrowers, displacing concerns about raising credit risk; (4) the complexity of securitization transactions obscured actual loss exposures and incubated fallacious investor complacency; (5) the downturn of the credit cycle brought doubts about the quality, security design, and pricing of high-yield securitization instruments – investors increased the risk premia and curtailed the capacity of asset managers to meet liability pressures; (6) short-term funding pressures and growing investor distrust and fly to safe assets conspired to magnify asset price deflation caused by mark-to-market valuation under fair value accounting standards; (7) issuers created structured investment vehicles that borrowed short-term money by issuing asset-backed commercial paper to fund the purchase of long-term credit-linked securities, thus creating a ill-fated maturity mismatch; and (8) the decrease of asset values leads to a liquidity reduction, a elevated asset price volatility, and funding constrains, causing significant market distress.

wisdom which emphasizes the distorted incentives that developed at all stages of the securitization process, and which allowed the 'hot potato' of bad loans to pass through the financial system to be held finally in the hands of unsuspecting final investors."

Several authors [e.g., Alles (2001), Jobst (2006a), and Jobst (2009)] argue that securitization may lead to a severe principal-agent problem when the originator retains little or no interest in the pool of securitized assets. In this case, the originator does not have the same incentive to pay attention to the creditworthiness of its customers as would be the case when the assets remains in its balance sheet. This idea is corroborated by Fabozzi and Kothari (2007), which assert that "*[G]iven the ability of lenders to pass along subprime loans into the capital markets via credit enhancement* […] *lenders have been viewed by critics of securitization as abandoning their responsibility of evaluating the creditworthiness of potential borrowers.*"

Gorton (2009) argues that an important problem is the loss of information when high complex structures are used to implement a securitization transaction. In the presence of asymmetric information, originators and issuers might be tempted to pursue their own economic incentives, which imposes a substantial agency cost on efficient asset securitization.[454] Asymmetric information problems can come from (1) the information advantage of the originator with respect to the quality of borrowers and the historical performance of individual asset exposures – adverse selection; and (2) the complex security design of securitized assets, which suggests superior information of arrangers about the true valuation of issued securities. Jobst (2009) points out that "*[T]he cause of the crisis can be traced to market failure stemming from conflicts of interest in the securitization process and ill-designed mechanisms to mitigate the impact of asymmetric information.*"[455]

Finally, the process of financial disintermediation via securitization may reduce the effectiveness of monetary policy, because banks derive more of their funding from

[454] Asymmetric information could lead to moral hazard on part of the issuers (asset originators in true sale transactions) if their effort level before and after the issue date is not incentive compatible with investor interests.

[455] Empirically, Downing, Jaffee, and Wallace (2009), based on a data set of MBS issued between 1991 and 2002, found that informed originators trade lemons in the mortgage market; i.e., the assets sold to the SPV are of lower quality compared to assets that are retained on the balance sheet. This idea is also corroborated by Titman and Tsyplakov (2010). They show that poorly performing originators are more willing to originate riskier mortgages because they have less incentive to carefully evaluate the credit quality of prospective borrowers.

capital markets. As asserted by Fabozzi and Kothari (2007), "*... during periods of tight monetary policy, banks can originate loans and then securitize the loans rather than holding them in their portfolio. This avoids the need for banks to fund the loans originated.*" For example, Loutskina and Strahan (2009) show that securitization has weakened the link between bank funding conditions and credit supply.[456]

<u>Tax, Accounting, and Legal Issues</u>

The main tax issue in securitization is related to whether there will be taxation at the level of the vehicle company; i.e., will the payments of the borrowers be considered taxable income to the SPV? Because the sole purpose of the SPV is to buy and hold assets until they liquidate, SPVs have no outside sources of income. The introduction of an entity-level tax would render most securitizations uneconomic. Moreover, originators desire to treat securitization as a financing for tax purposes rather than as a sale. As pointed out by Davidson et al. (2003), "*[S]ale treatment from a tax standpoint would generally accelerate taxable income. Issuers are also concerned that the securitization is tax effective and does not result in nondeductible interest costs or double taxation of residual income.*" In a typical securitization, a trust is used to receive the pool of assets and issue securities backed by these assets, because it allows to minimize the issuer's tax burden and it also establishes a legal separation between the originator and the pool of assets deposited in the trust.[457]

The key accounting issue is whether the securitization will be treated as a 'true sale' or a financing operation. Originators generally seek to record a securitization as a sale which requires immediate recognition of gain or loss on the transaction. Thus, based on

[456] Based on mortgages loans, Estrella (2002) and Kuttner (2000) support that securitization has had a significant impact on monetary policy. Similarly, Goswami, Jobst, and Long (2009) argue that the "*... transmission of monetary policy and its impact on the real economy may have become more complex, owing partly to financial innovation, such as securitization.*" They show that in mature markets securitization has lowered the impact of the monetary policy.
[457] See Davidson et al. (2003) for a more detailed description of issuing vehicles – e.g., grantor trusts, owner trusts, revolving trusts, master trusts, real estate mortgage investment conduits (REMICs), and financial asset securitization investment trusts (FASITs).

the proceeds of the sale of the bonds and the value of retained interests, firms may record a gain (or loss) on sale when completing a securitization transaction.[458]

The fundamental legal issue in securitization is whether the vehicle company, created for the purpose of holding the collateral, has sufficient title to the assets and is protected from bankruptcy or other disruptions at the issuing.[459]

In summary, the key elements of any securitization transaction are legislation, regulatory framework, and tax environment; i.e., if an originator considers to securitize a portfolio of assets it has to be aware of applicable laws, security regulation, and tax regime that may impact on the transaction. This holds particularly true for a post-credit crisis market. The securitization market has seen considerable regulatory changes during and following the credit crisis, which are likely to continue until 2013/2014.[460]

The Securitization Market

According to Tasca and Zambelli (2005), "*[T]he concept of asset securitization was introduced in the US financial system in the 1970s, when the Government National Mortgage Association issued securities backed by a pool of loans, represented by residential mortgages.*" This is the major reason for the development of the strong U.S. housing finance market. Afterwards, securitization technique has been applied to other assets such as credit card payments and auto loans receivables. It has also been employed as part of asset/liability management, in order to manage balance sheet risk for financial institutions. The first European transaction was also a RMBS, issued in the U.K. in 1987. Around the early 1990s the first securitizations from other European countries have started. The first countries to join the U.K. in issuing ABS were Spain and France. These countries continued to be the main issuers until the mid-1990s, when Finland, Sweden, Ireland, Italy, and Germany joined the growing list of countries using

[458] As pointed out by Roever and Fabozzi (2003), the principal "*... among the accounting issues is whether the financing meets the requirements for off-balance-sheet treatment.*" Usually, an asset transfer that is treated as a true sale for legal purposes qualifies as off-balance sheet financing if the SPV is a legally independent company from the seller.
[459] See, e.g., Rutledge and Raynes (2010) for a further explanation of the legal and accounting treatment of securitization transactions.
[460] See Krebsz (2011) for further discussion of the legislative initiatives implemented in E.U. and U.S.; e.g., Basel III, EU Green Paper on Corporate Governance, Dodd-Frank Wall Street Reform and Consumer Protection Act – Asset-backed securities, and proposals to strengthen financial supervision in Europe.

securitization. But it was in the second half of the 1990s that securitization really began to take off as legislative changes in many countries began to simplify the process and to allow securitization to expand into new countries and asset classes. Finally, the introduction of the euro in 1999 has significantly increased the importance of the European securitization market.[461] Thus, till mid-2007 it has rapidly developed within U.S. and Europe.

The diversity of the assets and the direct involvement of the public sector are characteristics differentiating the European market from the much larger and developed U.S. market. While, in U.S., the catalyst for securitization was the U.S. government's objective for encouraging home ownership and creating a secondary market for mortgages, in Europe, there has been no government body to act as a catalyst. In most European countries, larger commercial banks have issued the first MBS with the objectives of regulatory arbitrage, diversification of funding sources, and as a response to the appeal of international investors. A number of governments started to use securitization as a means of reducing public budget deficits in order to meet the Maastricht criteria. Additionally, "*[T]he lack of a large powerful body to provide for homogenization and standards and the differing legal frameworks on each European government provide a very different setting for securitization than in the United States.*" [Adams (2005)].[462]

The span and maturity of U.S. market means that most legal issues (at least the basics) have long since been settled. However, in Europe, the legal setup of a deal is crucial, complicated, and is the main upfront cost for originators. In a securitization transaction in Europe, there are three important areas to think about with respect to legislation: (1) type of law – Napoleonic (e.g., Belgium, Spain, France, Luxemburg, and Portugal), Anglo-Saxon (e.g., United Kingdom), or Germanic (e.g., Sweden, Denmark, Finland, Norway, Austria, Netherlands, and Germany); (2) securing the assets and cash flows; and (3) local framework for securitization. That is why Adams (2005) asserts that "... *although we may at times discuss the European securitization market as if it were a*

[461] According to Altunbas et al. (2009), in addition to the inception of the single currency "*... more regional factors such as the closer integration in European financial markets as well as a move towards a more market-based financial system…*" can explain the escalation in securitization in Euro zone.

[462] The wide divergence in market sizes within the European countries is a reflection of the very different economic, political, historical, legal, and social frameworks.

single market, it is in fact a collection of quite distinct markets, which differ considerably in their legal systems, the nature of their financial sectors, and social attributes. These differences are reflected in the variety of securitization structures and transactions types."

The use of securitization has increased since the beginning of the financial crisis in August 2007. However, the European sovereign debt crisis has limited the increase of securitized products; and its use has changed since that time, namely because an increasing number of banks have underwritten their own securitization programs, to use them as a guarantee for obtaining resources in the auctions of the European Central Bank (ECB), issuing the so-called Covered Bonds. According to Cardone-Riportella et al. (2010), this practice have partially replaced the issue of debt, or the interbank market itself, as sources of finance to enable banks to grant loans.[463]

Looking to the evolution of the structured finance markets, it is possible to conclude that asset securitization has become one of the most visible consequences of financial innovation in recent years. In Europe, the volume of securitized assets grew from Euros 78.2 billion in 2000 to Euros 711.1 billion in 2008. Although the current financial crisis, in which securitization seems to have played a determinant role, the pressing need for liquidity among financial entities provoked a sharp change after the first quarter of 2008. In 2010, a total of Euros 382.9 billion of securitized products were issued in Europe, a decline of 7.52% from 2009 (Euros 414.1 billion). RMBS continues to make up the majority of placed issuance (Euros 271.7 billion in 2010), followed by SME loans (Euros 39.7 billion), ABS (Euros 31.4 billion), CDO (Euros 29.6 billion), CMBS (Euros 6.1 billion), and WBS (Euros 4.5 billion).[464]

[463] See Krebsz (2011) for a further discussion of the market evolution of securitization post 2007/2008 financial crisis.
[464] Data according to the Association for Financial Markets in Europe Securitisation Data Report Q3: 2011, available at http://www.afme.eu/reports.aspx.

Annex 2: Project Finance[465]

Definition of Project Finance

Nevitt and Fabozzi (2001) present project finance as the process of financing "... *a particular economic unit in which a lender is satisfied to look initially to the cash flows and earnings of that economic unit as the source of funds from which a loan will be repaid and to the assets of the economic unit as collateral for the loan.*" Thus, the funding does not depend on the reliability and creditworthiness of the sponsors and does not even depend on the value of assets that sponsors make available to financiers. In this line of reasoning, Gatti (2005) refers to project finance as "... *the structured financing of a specific economic unit that the sponsors create by means of share capital, and for which the financier considers cash flows as the source of loan reimbursement, whereas project assets only represent collateral.*"

Considering that debt repayment comes from the project only rather from any other entity (nonrecourse debt),[466] Esty (2004b) defines project finance as a transaction that "… *involves the creation of a legally independent project company financed with equity from one or more sponsoring firms and non-recourse debt for the purpose of investing in a capital asset.*" Esty focuses on the following three key decisions related to the use of project finance: (1) investment decision (involving industrial assets); (2) organizational decision (creation of a legally independent company to own the assets – off-balance sheet form of financing); and (3) financing decision (nonrecourse debt – debt can be structured without recourse to the sponsors). This definition distinguishes project finance from other (structured) financing vehicles like securitization, leveraged acquisitions, and structured leasing.

465 For enlightening theoretical studies of project finance see, among others, Shah and Thakor (1987), John and John (1991), Chemmanur and John (1996), and An and Cheung (2010). Brealey, Cooper, and Habib (1996), Kleimeier and Megginson (2000), Blanc-Brude and Strange (2007), and Esty (2001, 2002b, 2007), among others, present important descriptive studies on this area of research. For interesting empirical studies see, e.g., Esty and Megginson (2003), Sorge (2004), Dailami and Hauswald (2007), Sorge and Gadanecz (2008), and Kleimeier and Versteeg (2010).

466 At the other extreme, in conventional corporate financing, lenders rely on the overall creditworthiness of the enterprise financing a new project to provide them security. Project finance differs from asset securitization because while the borrower is a legal independent entity as it is in asset securitization, the structure is project financing and do not involve financial assets.

Over the last 35 years, project finance has been an important source of funding for public and private ventures around the world. It is most commonly used for capital-intensive facilities and utilities – such as power plants, refineries, toll roads, pipelines, telecommunications facilities, and industrial plants – with relatively transparent cash flows, in riskier than average countries, using relatively long-term financing.[467] In Gatti (2008), Megginson refers that "*... the distinguishing features of project finance (PF) are, first, that creditors share much of the venture's business risk and, second, that funding is obtained strictly for the project itself...*".

The given definitions of project finance emphasize the idea that lenders have no claim to any other assets than the project itself. Therefore, lenders must completely satisfy themselves with a project fully capable of meeting its debt and equity liabilities. The success of a project finance transaction is highly associated with structuring the financing of a project through as little recourse as possible to the sponsor, while at the same time providing sufficient credit support through guarantees or undertakings of a sponsor or third party so that lenders will be satisfied with the credit risk.[468] As pointed out by Brealey, Cooper, and Habib (1996), the allocation of specific project risks to those parties best able to manage them is one of the key comparative advantages of project finance.

Project Finance Characteristics and Players

Project finance, commonly referred as 'off-balance-sheet' financing, is often used to segregate the credit risk of the project from that of its sponsors so that lenders, investors, and other parties will appraise the project strictly on its own merits.[469] It involves the creation of an entirely new vehicle company, with a limited life, for each new investment project. Project companies (1) are legally independent entities with very

[467] This idea is corroborated by Megginson (2010) who asserts that project finance "*... has proven to be an especially efficient method of obtaining long-term, relatively low-cost financing for capital intensive projects in relatively risky countries.*" Project finance is not used in funding high-risk investments with uncertain returns. So it is rarely used to fund research and development activities, new product introductions or other intangible investments.
[468] See Fabozzi et al. (2006) for a description of the key elements of a successful project financing transaction.
[469] The idea is not to hide a liability of the sponsor from creditors, stockholders or rating agencies since the obligations of a sponsor with respect to the project may have to be shown in the sponsor's financial statements or in footnotes thereto.

concentrated equity ownership; (2) have high leverage;[470] and (3) are funded through a series of legal contracts.[471] This idea is corroborated by Esty (2004b), who describes project finance as a form of financing based on a standalone entity (project company), with highly levered capital structures, concentrated equity ownership,[472] and concentrated debt ownership.[473]

The core of project finance is the analysis of project risks, namely: (i) construction risk; (ii) operating risk; (iii) market risk; (iv) regulatory risk; (v) insurance risk; and (vi) currency risk.[474] These risks are allocated contractually to the parties best able to manage them.[475] The process of risk management is usually based on the following interrelated steps: (1) risk identification; (2) risk analysis; (3) risk transfer and allocation; and (4) residual risk management. Gatti (2008) argues that the process of risk management is crucial in project finance transactions and they must be identified and allocated to create an efficient incentivizing tool for the parties involved.[476]

Gatti (2005) points out the following five distinctive features of a project finance transaction: (1) the debtor is a project company (special purpose vehicle) that is financially and legally independent from the sponsors – project companies are standalone entities; (2) financiers have only limited or no recourse to the sponsors –

[470] According to Esty (2004b), project companies' "*... average book value debt-to-total capitalization ratio is 70%, which is roughly two to three times higher than the average leverage ratio of a typical publicly traded company.*"
[471] Esty (2003) identifies the following structural attributes of project companies: (1) involve separate legal incorporation; (2) employ very high leverage compared to public companies; (3) have highly concentrated debt and equity ownership structures; (4) board of directors are comprised primarily of affiliated directors from sponsoring firms; and (5) have complex contractual structures.
[472] The typical project finance transaction has few shareholders (three of four) compared to hundred or thousand shareholders in public companies.
[473] Using a sample of 495 project finance loan tranches (made between 1986 and 2000), Esty and Megginson (2003) conclude that "*[T]he tranches exhibit high absolute levels of debt ownership concentration: the largest single bank holds 23% while the top five banks collectively hold 61.2% of a typical tranche.*" See, e.g., Esty (2003) and Esty and Sesia (2004) for more extensive description of the institutional details of project companies.
[474] Fabozzi et al. (2006) present three main timeframes in which project finance risks can be divided: (i) engineering and construction phase; (ii) start-up phase; and (iii) operations phase. Gatti (2008) identifies risks related to the precompletion phase – activity planning risk, technological risk, and construction risk or completion risk; risks related to the postcompletion phase – supply risk, operating risk, and demand risk; and risks related to both phases – interest rate risk, exchange risk, inflation risk, environmental risk, regulatory risk, political risk, country risk, legal risk, and credit risk or counterparty risk.
[475] For example, through construction guarantees, purchase agreements and other type of output contracts, supply agreements, insurance policies, indemnifications, and other contractual agreements.
[476] Thus, project finance can be seen as a system for distributing risk among the parties involved in a venture; i.e., the effective identification and allocation of risks allows the minimization of the volatility of cash flows generated by the project.

their involvement is limited in terms of time, amount and quality;[477] (3) project risks are allocated to those parties that are best able to manage them;[478] (4) the cash flow generated by the project must be sufficient to cover operating cash flows and service the debt in terms of interest and debt repayment; and (5) collateral is given by sponsors to financiers as security for cash inflows and assets tied up in managing the project.

Corielli et al. (2010) argue that one of the key characteristics of project finance transactions is the existence of a network of nonfinancial contracts (NFCs),[479] organized by the SPV with third parties, often involving the sponsoring firms as well; i.e., a project finance transaction can be viewed as a nexus of contracts between the players involved in such a deal.[480] According to Corielli et al. (2010), of the numerous contracts four are particularly important, which are: (1) construction contracts and engineering, procurement, and construction (EPC) – closed on a turnkey basis; (2) purchasing agreements – to guarantee raw materials to the SPV at predefined quantities, quality, and prices; (3) selling agreements – enables the SPV to sell part or all of its output to a third party that commits to buy unconditionally at predefined prices and for a given period of time; and (4) operation and maintenance agreements – compliant with predefined service-level agreements. This contractual bundle is then presented to creditors to seek debt financing, serving as the basis for negotiating the quantity and the cost of external funding. Exhibit 1 presents a graphic representation of typical contractual framework in project financing.

[477] Banks have no recourse to assets of parties launching the project in the event of default. As referred by Gatti (2008), "*[T]his means that risks associated with the deal must be assessed in a different way than risks concerning companies already in operation.*"

[478] A Project finance transaction must first of all demonstrate that it has a balanced and viable allocation of risks between the various parties concerned. Even when there is limited recourse instead of no recourse, the situation is the same. For example, construction risk is borne by the contractor, the risk of insufficient demands for the project output by the purchaser, etc. See Gatti (2005) for a comprehensive comparison between project financing and corporate financing.

[479] They define nonfinancial contracts as "*… contracts that generate cash inflows and outflows that affect the unlevered free cash flows of the SPV.*"

[480] Project finance is commonly referred as 'contractual finance': the project company sign contracts with construction firms, suppliers, customers, host governments, and lenders. As referred by Esty and Megginson (2003), "*[T]his nexus of contracts, to use Jensen and Meckling (1976) characterization of the firm, is intended to ensure loans repayment when the project is solvent and loan recoverability when the project is in default.*" See, e.g., Gatti (2008) for a description and explanation of the network of contracts that the SPV sets up with all the different counterparties.

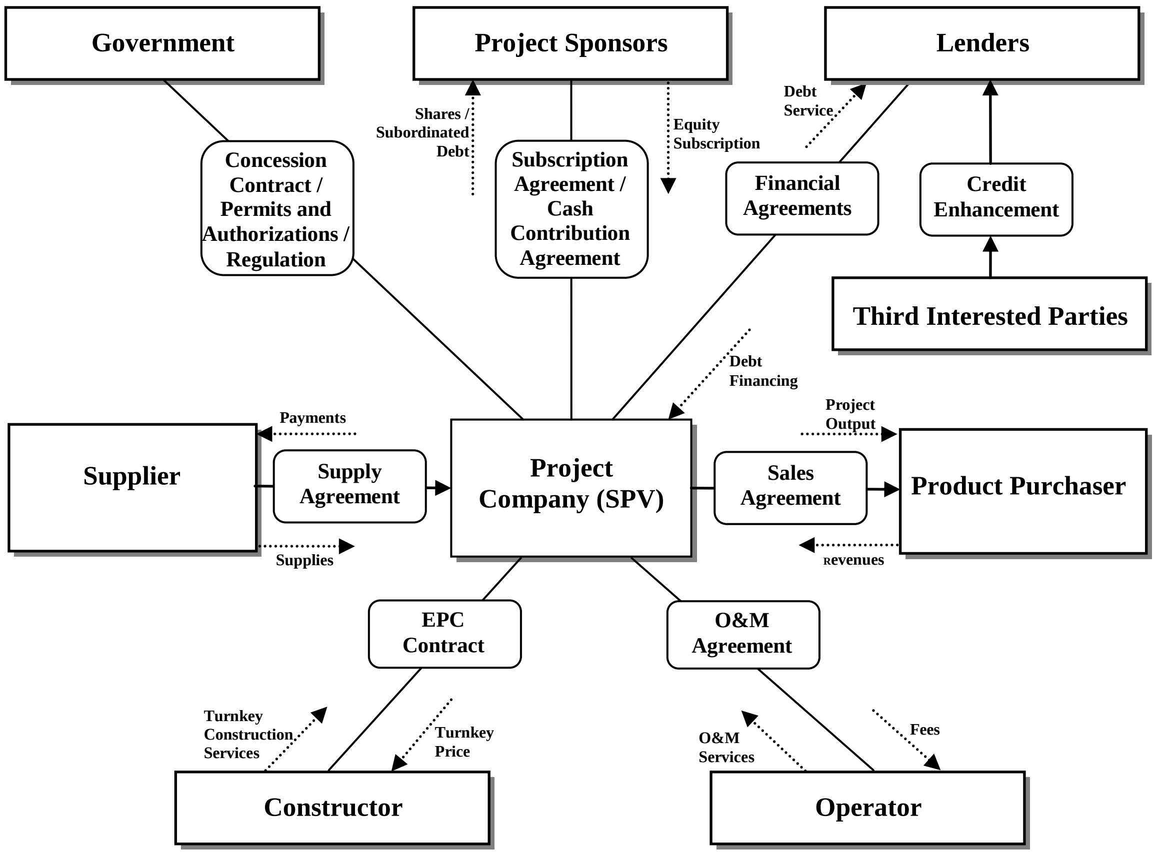

Exhibit 1: Typical contract structure of a project finance deal.
Source: Adapted from Buljevich and Park (1999).

It is possible to identify the following key players in project finance (see Exhibit 1): (1) the project sponsors;[481] (2) the host government (and often state-owned enterprises);[482] (3) the constructing and engineering firms; (4) the legal specialists; (5) the accounting, financial, and risk assessment professionals; (6) the lead arranging banks;[483] (7) the

[481] A controlling stake in the equity of the separate company established for the purpose of undertaking the project will typically be owned by a single project sponsor, or by a group of sponsors. There are four types of sponsors that are often involved in project finance transactions and invest in the SPV [Gatti (2008)]: (1) industrial sponsors – see project finance as an initiative linked to their core business; (2) public sponsors – government or other public bodies whose aims center on social welfare; (3) contract sponsors – they develop, build and run the projects and provide equity and/or subordinated debt to the SPV; and (4) purely financial sponsors – they invest capital with the aim of gathering high returns (e.g., commercial banks, multilateral development banks, and private equity funds).

[482] The project company will in most cases need to obtain a concession from the host government. Additionally, sometimes the host government needs to establish a new regulatory framework or provide environmental permits.

[483] If the inception of the SPV is the first step in all project finance transactions, the work developed by the lead arranging bank is crucial. We can identify the following three key tasks executed by lead arrangers: (1) perform the due diligence on the vehicle company and the project itself to ensure that all potential adverse information is revealed before loan syndication; (2) design an optimal loan syndicate that will deters strategic defaults but allows for efficient negotiation in the event of liquidity defaults; and

participating banks;[484] and (8) the suppliers and customers. A single participant in a project finance deal can take on a number of roles; e.g., a contractor can be sponsor, builder, and operator at the same time; banks can be sponsors and lenders simultaneously. As asserted by Gatti (2008), "*... in project finance transactions, the fact that only a few players (i.e., the sponsors) participate in a variety of ways is perfectly natural. In fact, the primary interest of sponsors is to appropriate the highest share of cash flows generated by the project.*" Furthermore, not all the organizations shown in Exhibit 1 are necessarily involved. For example, a deal with exclusively private actors would not count sponsors belonging to the public sector. Finally, we present a structure in which financing is provided directly to the SPV. However, financing may also be structured through leasing vehicles or with a bond offer to the financial market.

Advantages and Disadvantages of Project Financing

Nevitt and Fabozzi (2001) assert that any one or a combination of the following objectives may be a motivation for a borrower to use a project finance transaction: (1) to avoid affecting its credit rating; (2) to avoid showing increased debt on the balance sheet – so as not to impact financial ratios;[485] (3) to limit direct liability to a certain period of time, to avoid a liability for the remaining life of the project; (4) to avoid being within the scope of restrictive covenants in an indenture or loan agreement that precludes direct debt financing or leases for the project. The authors claim that "*[P]roject financing can sometimes be used to improve the return on the capital invested in a project by leveraging the investment to a greater extent than would be possible in a straight commercial financing of the project.*" Being true that leverage increases expected equity returns, a higher leverage also increases equity risk and

(3) spearhead monitoring of the borrower after the loan closes and discourage the sponsor from strategically defaulting or otherwise expropriating project cash flows [Gatti (2008)].

[484] A large fraction of the needed finance for the infrastructure projects is generally raised in the form of debt from a syndicate of lenders such as banks and specialized lending institutions and, less frequently, from bond markets. Brealey, Cooper, and Habib (1996) present ownership structure differences between these two forms of financing as the main reason for the widespread use of bank finance. They assert that "*[T]he concentrated ownership of bank debt encourages lending banks to devote considerable resources to evaluating the project.*"

[485] The off-balance sheet treatment of the funding raised by the SPV is crucial for sponsors since it has only limited impact on sponsors' creditworthiness, and does not impact sponsors' ability to access additional financing in the future. This advantage of project finance for sponsors is also presented in literature by Shah and Thakor (1987), John and John (1991), and Chemmanur and John (1996).

expected distress costs [Esty (2003)]. Thus, we need more compelling motivations to use project finance.

To understand the motivations for using project finance we need a thorough understanding of why the combination of a firm plus a project might be worth more when financed separately with nonrecourse debt (project finance) than when they are financed jointly with corporate funds (corporate financing).[486] Brealey, Cooper, and Habib (1996) argue that project finance creates value by resolving agency problems and improving risk management. Esty (2003, 2004a, 2004b) takes a more general view of the problem and presents the following four primary motivations for using this type of structured finance transactions: (1) agency cost motivation;[487] (2) debt overhang motivation;[488] (3) risk management motivation;[489] and (4) asymmetric information motivation.[490] Another economic benefit pointed out by Esty (1999) is the reduction of

[486] A sponsor can select to finance a new investment project using two alternatives: (1) the new project is financed on-balance sheet – corporate financing; (2) the new project is financed off-balance sheet by incorporation into a newly created economic entity (SPV) – project financing. See Gatti (2008) for further discussion of the main differences, advantages, and disadvantages between corporate financing and project financing.

[487] Project finance can be used to mitigate costly agency conflicts (1) inside project companies – conflicts between sponsors (ownership) and managers (control) and conflicts between sponsors and related parties; and (2) among capital providers – conflicts between debt holders and equity holders. Project finance highly levered capital structures plays an important disciplinary role because it prevents managers from wasting free cash flow, and deters related parties from trying to appropriate it [Esty (2004b)].

[488] Esty (2004a) argues that project finance transactions "*... reduce leverage-induced underinvestment in sponsoring companies, a phenomenon known as 'debt-overhang'.*" So, this type of structured finance transactions allows companies with little spare debt capacity to avoid the opportunity cost of underinvestment in positive NPV projects. According to Esty (2003) project finance solves this problem "*... by allocating project returns to new capital providers in a way that cannot be replicated using corporate debt.*" Because this conflict occurs at the sponsor rather than the project level we distinguish the debt-overhang problem from agency cost motivation. See Myers (1977) for further development of debt overhang phenomenon.

[489] Underinvestment problems due to distress costs and/or managerial risk aversion [Stulz (1984)] can be reduced through project finance transactions. The nonrecourse nature of project debt protects the sponsoring firm from risk contamination (i.e., when a failing project drags a healthy sponsoring firm into default or impose increased distress costs on it). As asserted by Esty (2004b), project finance "*... allows the firm to isolate asset risk in separate entity where it has limited ability to inflict collateral damage on the sponsoring firm; in essence, it allows firms to truncate large left-hand tail outcomes, which Stulz (1996) claims is the primary goal of risk management.*" Additionally, project finance creates value by improving risk management inside the project. Risks are allocated with the goals of reducing cost and ensuring proper benefits; i.e., they are allocated to the parties that are in the best position to manage them.

[490] Project finance can help to reduce underinvestment due to asymmetric information. According to Esty (1999) "*[T]he separation of projects from the sponsoring firm or firms facilitates initial credit decisions* […] *With a small lending syndicate and extensive negotiations, it is relatively easy to convey information that would either be more difficult with a larger group of creditors or undesirable for competitive reasons.*" In a incomplete information framework, the joint evaluation of the project and existing assets can be problematic. In this line of reasoning, Shah and Thakor (1987) point out that the main benefit of project finance is to reduce the information search costs. Similarly, Kensinger and Martin (1988) argue, based on a signaling model, that riskier projects should be projected-financed to reduce signaling costs.

corporate taxes, namely: (1) tax rate reductions and tax holidays are commonly observed in project finance deals; and (2) high leverage increments interest tax shields.[491]

Project finance is of great demand when it does not have a substantial impact on the balance sheet or the creditworthiness of the sponsoring entity or entities. According to Fabozzi et al. (2006) "*[T]he ultimate goal in project financing is to arrange a borrowing for a project that will benefit the sponsor but at the same time have absolutely no recourse to the sponsor, and therefore no effect on its credit standing or balance sheet.*" They point out the following benefits from using project financing: (1) improvement in the return on invested capital by leveraging investment – higher leverage may be achieved; (2) availability of credit sources and/or guarantees to the project that would not otherwise be accessible to the sponsor; (3) better credit terms and lower interest costs;[492] (4) prevention of regulatory problems affecting the sponsor; and (5) segregation of costs for regulatory purposes.

Gatti (2005) argues that the use of project finance potentially enables sponsors to obtain several benefits, namely: (1) reduction of funding costs;[493] (2) maintenance of the sponsors' financial flexibility;[494] (3) higher debt-to-equity ratios;[495] and (4) 'insurance'

[491] This idea is corroborated by John and John (1991), who refer that project financing increases value by increasing value of tax shields.

[492] Kleimeier and Megginson (2000) find that "*... floating-rate PF loans have lower credit spreads (over LIBOR) than do most comparable non-PF loans.*" According to Stiglitz and Weiss (1981), the distinctive role of banks is to overcome information problems and minimize adverse selection in the lending market. Financial intermediation, information revelations, and monitoring are the channels through which banks reduce the costs of funds [Diamond (1984)]. Project finance enables lenders to distinguish project performance from firm performance, monitor project management decisions, and determine the cash flow available for interest and principal repayment.

[493] As asserted by Gatti (2005), this happens when the "*... structuring cost for the initiative (that in any event is very high, especially if the deal is extremely complex) is less than the saving on funding cost, owing to the improved credit rating obtainable by the venture when compared to that of the sponsor.*" The same intuition is presented by Esty (2003) which states that "*... project finance reduces the net cost of financing these assets* [i.e.] *project companies have evolved as institutional structures that reduce the cost of performing important financial functions such as pooling resources, managing risk, and transferring resources through time and space…*" In short, project finance reduces risk by virtue of credit enhancement and other structuring devices that reduce lender exposure by altering borrowers risk profiles over time.

[494] If the project to be implemented will represent a significant part of the sponsor's assets, its implementation will increase debt and the cost of future credit lines and eventually preclude future initiatives with a positive NPV. By using project finance – a off-balance sheet structured deal – the funding concerns an *ad hoc* legal entity involving no or limited recourse to the sponsor.

[495] According to Gatti (2008) this is possible because "*[P]roject finance allows for a high level of risk allocation among participants in the transaction.*" Esty (2002a) argues that project companies located in countries with a high sovereign debt rating – measured according to Standard and Poor's rating system –

against any eventual negative impact of the project.[496] In 2008, Gatti focused on two essential benefits: (1) separate incorporation and prevention of contamination risk – the separation of large, risky projects in an SPV, that is, off-balance sheet, avoids that the new project contaminates the company or other projects; and (2) conflicts of interest between sponsors and lenders and wealth expropriation – the separation between the company and the new investment project is always the first best option for shareholders, but can cause wealth expropriation from creditors.

In conclusion, sponsors use project finance where the structure can reduce the costs associated with market imperfections. As pointed out by Esty (1999), "*... the size of the transactions costs incurred in structuring deals suggests that the benefits from reducing information asymmetries, incentive conflicts, taxes, and distress costs must be significant.*"

Despite the advantages, it is possible to identify several disadvantages of project finance. According to Fabozzi et al. (2006) the main disadvantages are: (1) complexity (in terms of designing the transaction and writing the required documentation); (2) higher costs of borrowing when compared to conventional financing; (3) the negotiation of the financing and operating agreements is time-consuming. As pointed out by Esty (2004a), project finance also has some drawbacks, particularly: it is expensive to set up, it takes a long time to execute, and it is highly restrictive once in place.[497] Similarly, Gatti (2008) refers that the principal drawback of project finance is that structuring such a deal is more costly than the corporate financing option. The author presents the following reasons: "*1. The legal, technical, and insurance advisors of the sponsors and the loan arranger need a great deal of time to evaluate the project and negotiate the contracts term to be included in the documentation; 2. The cost of monitoring the project in process is very high; 3. Lenders are expected to pay significant costs in exchange for taking on greater risks.*"

have higher debt to total capitalization ratios than those project companies located in countries with a low debt rating. Similarly, Vaaler, James, and Aguilera (2008) find that project firms located in countries with common law legal systems, stronger creditor rights, and wealthier economies generally have higher leverages, indicative of lower project risk.

496 The author argues that in project finance the only collateral is the project's cash flows and assets, whereas the sponsor's assets remain unencumbered.

497 Esty (2003) estimates transaction costs to be around 5% of the deal value.

Although some counter-intuitive features of project finance when compared to corporate financing – e.g., the creation of a stand-alone company takes more time, entails greater transaction costs, higher leverage increases the probability of default, and, in most cases, this implies higher debt rates – Esty (2004b) refers that in practice "*... the individual structural components fit together in a very coherent and symbiotic way, and can reduce the net financing costs associated with large capital investments…*" Similarly, Bonetti et al. (2010) refer that "... *a cost/benefit analysis reveals that the additional expenses are more than compensated for by the advantages that arise from off-balance sheet financing and appropriate risk allocation.*"

Financing the Deal[498]

According to Megginson (2010) project finance projects are "... *funded with small amounts of private equity contributions and much larger amounts of nonrecourse syndicated loans, which are the principal external, capital-market financing.*" Thus, equity and bank debt are the principal financing instruments in a project finance transaction. The SPV's shareholders are expected to provide a certain amount of equity capital in order to demonstrate their commitment to the project.[499] Debt funding can consist of either bank debt – this has been the common means of financing – or financing from bond issues or a combination of both. Bank debt tends to be more expensive than bonds with higher rates and shorter loan duration. However, once a project has completed the development phase including construction, the risk profile alters and the SPV can obtain better refinancing terms and lower rates for the rest of its projected life.

Syndicated loans are the prominent form of funding for project-financed investments.[500] Esty and Megginson (2003) find that: (1) debt ownership is highly and significantly more concentrated than equity ownership; and (2) debt ownership concentration is

[498] See Gatti (2008) – Chapter 6 – for further discussion of how syndicated loans and bond issues are organized and how sponsors can obtain funds to invest in their projects.
[499] According to Fox and Tott (1999) this proportion depends upon the risk profile of the project, commonly between 10% and 15% of the total project costs.
[500] As asserted by Esty and Megginson (2003), "*[A] bank syndicate is a collection of banks that jointly extends a loan to a specific borrower* […] *Lending syndicates resemble pyramids with a few arranging banks (arrangers) at the top and many providing banks (providers) at the bottom.*" See Esty (2001) for a more detailed description of the syndication process.

positively related to the strength of creditor rights and the reliability of legal enforcement.

Large-scale projects require substantial investments up-front and only start to generate cash inflows after a relatively long construction period. Thus, as pointed out by Sorge and Gadanecz (2008), "*... matching debt repayment obligations with project revenue cash flows implies that, on average, project finance is characterized by much longer maturities compared to other forms of financing.*" In terms of the cost of funding, Kleimeier and Megginson (2000) assert that "*... floating-rate PF loans have lower credit spreads (over LIBOR) than do most comparable non-PF loans.*" The absence of a clear relationship between spreads and maturity in PF seemed a particular puzzle. Sorge and Gadanecz (2008) argue that whereas spreads for both investment and speculative-grade loans other than project finance are a positive linear function of maturity, PF loans have a 'hump-shaped' or non-linear term structure. This occurs because: (1) as PF loans tend to have short-term liquidity constrains, lenders grant longer maturities to avoid increasing the projects' probability of default; and (2) projects go through fairly predictable risk phases that are gradually resolved, with spreads first raising and then falling over time.

Project Financing Recent Trends[501]

Kleimeier and Megginson (2000) point out that "*[T]he use of project finance to fund natural resources, electric power, transportation, and other ventures around the world has risen steadily for the past four decades, from its modern beginnings financing development of the North Sea oil fields during the 1970s.*" Data reported by Esty and Sesia (2007) indicate that, in the United States, the project finance market is smaller than the total value of corporate bond issues but larger than the total value of funds raised through initial public offerings or venture capital funds – considering all global markets, project finance bank loans and project bonds recorded 23% and 15% compound annual growth rates, respectively, from 1994 to 2006. Project finance hasn't contracted significantly during current financial crisis when compared to other forms of

[501] See Fabozzi et al. (2006) for further discussion of project finance recent trends. Gatti (2005, 2008), among others, presents an interesting perspective of the market evolution over the years, focusing on the European situation and on sectors that adopt project finance techniques and PPP initiatives.

financing. Indeed, the total value of project finance arranged worldwide hit a record of \$320.9 billion during 2008, and dropped only 9% to \$292.5 billion during 2009.[502] As asserted by Megginson (2010), "*[C]learly, PF has been gaining global financing market share over the past two decades, especially as a vehicle for channeling development capital to emerging markets.*" This indicates that the financial crisis has had a small impact on the financing of large infrastructures and still represents a promising segment of global lending activity.

According to Gatti (2005) the growth trend of project finance transactions in the eighties and nineties moved along two lines: (1) expansion of project finance in developed countries – promoters begun to promote project finance technique to developing country governments as a way to rapidly create basic infrastructures and ensure a greater involvement of private capital, guaranteed by Export Credit Agencies in their own countries; and (2) development of project finance in developed countries as a way to realize projects that had lower market risk coverage or projects in which the government intervened to promote realization of public works (public-private partnerships).

As far as financing is concerned, sponsors have been reverting to more structured deals, as a way to shift market risk from companies back to the buyers of the project's output. Additionally, sponsors can use various hybrid structures to mitigate risks, which are better suited for certain types of assets and have the potential to expand the boundaries of project finance into new asset classes. Public private partnerships (PPPs) are an example of a hybrid structure that is become more common. As referred by Esty (2004a), "*PPPs use private capital and private companies to construct and then operate project assets, such roads, prisons, and schools, which historically have been financed with public resources and operated on a not-for-profit basis. Through PPP structures, governments shift construction and operating risks to the private sector, which is usually more efficient in building and then running the asset. However, governments assume the market risk…*"[503] In these partnerships the role of public bodies is usually based on a concession agreement.

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[502] Source: Dealogic.

[503] Blanc-Brude and Strande (2007) define PPP as "*… an increasingly popular method of procurement of public infrastructure projects – one in which a public authority commissions the design, construction,*

Various acronyms are used in practice for the different type of concession agreements, namely: (1) BOT (build, operate, and transfer); (2) BOOT (build, own, operate, and transfer); and (3) BOO (build, operate, and own).[504] In UK (the first country to launch a systematic program of such projects) PPPs are part of what is known as the Private Finance Initiative (PFI), which is a strategic economic policy to migrate public administration from being the owner of the assets and infrastructures, becoming rather a purchaser of services from private parties.[505] A government that uses project finance obtains both private-sector funding and private-sector management. Project finance thereby reduces the need for government borrowing, shifts part of the risks presented by the project to the private sector, and aims to achieve more effective management of the project [Brealey, Cooper, and Habib (1996)].[506] As referred by Blanc-Brude and Strange (2007), "*... risk transfer is the fundamental theoretical justification of PPP: the benefits of efficient risk management by private investors (keeping down construction and operating costs delays) are expected to more than offset the cost of risk-pricing by private financiers.*"[507] Klompjan and Wouters (2002) refer that one of the main advantages of a PPP for a government or a public entity is allowing a project to proceed without being a direct burden on the government's budget.

In this regard, a distinction is commonly made among operators: (1) project finance initiatives which are fully self-financed (project finance in the strict sense) – the assessment is based on the soundness of the contractual framework and the counterparties; and (2) those that are partially self-financed – the bankability depends considerably on the level of public grants conferred.

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operation, maintenance, and financing of a public infrastructure project from a private consortium within a single contractual framework." Standard and Poor's definition of a PPP is any medium-to-long term relationship between the public and private sectors, involving the sharing of risks and rewards of multisector skills, expertise and finance to deliver desired policy outcomes (Standard & Poor's PPP Credit Survey, 2005).

[504] See Gatti (2008) for an explanation of the different concession agreements.

[505] See, e.g., Akbiyikli et al. (2006) for further discussion of PFI.

[506] However, a question can be raised: why project finance if privatization can lead to the same results when talking about PPPs? Brealey, Cooper, and Habib (1996) give the following reasons: (1) privatization is more complex and involves the entire industry; (2) there are areas (e.g., health and education) where it may be possible to involve private funding for particular projects but not for all the sector; and (3) "*... unless the industry is to be entirely foreign-owned, privatization requires a large capital market, in contrast to project financings, which take place piecemeal and over a period of time.*"

[507] Despite all of the advantages connected to PPPs, there also are pivotal points of concern and criticism. For example, some critics argue that the cost of funding in a PPP is higher than the cost of public funds.

Another important influence on the future of project finance is the impact of bank regulation. According to the Basel II accord[508] (The New Basel Capital Accord), project finance loans have higher default and loss rates than commercial loans and, therefore, deserve higher capital requirements. In its preliminary assessment, the Committee argues that project loans "*... posses unique loss distribution and risk characteristics*…", including "*... greater risk volatility*…" than other types of bank loans, which could lead to "*… both high default rates and high loss rates…*" [BIS (2001)]. Thus, spreads on low-rated project finance loans would have to increase.

Casting doubt on such arguments, however, exiting research indicates that project loans perform substantially better than corporate loans, and default rates and recovery rates are not necessarily correlated. Using a sample of 759 loans, Standard & Poor's (2004) found that the loss given default (LGD) of project finance loans is quite low (25% on average) and that, thanks to restructurings, 100% of loan values were maintained in their sample. Moreover, the study also reported that PF loans have better LGD rates than secured, senior, and senior unsecured corporate debt.[509] Notwithstanding, the New Capital Accord (and even the Basel III accord) states that unless banks qualifies for the internal rating based (IRB) approach, the capital reserve requirements for project loans must be increased, especially for transactions falling within in the best rating classes.

Considering the referred change in the regulatory environment, the development of methods for offsetting the impact of the New Capital Accord rules on project finance loans become a relevant issue. For example, banks developed till mid-2007 their capabilities to securitize project finance loans – issuing collateralized loan obligations (CLOs) or collateralized debt obligations (CDOs), thereby creating a new asset class for institutional investors.[510] Credit Suisse First Boston was the first institution to securitize

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[508] Developed by the Basel Committee on Banking Supervision, established by the Bank of International Settlements (BIS) with the objective to create international banking standards and develop new standards for banks. The BIS, headquartered in Basel, Switzerland, has the mission to serve as a central banks in their pursuit of monetary and financial stability, to foster international cooperation in those areas and to act as a bank for central banks.

[509] See also Beale et al. (2002) for a first analysis of this subject. They argue that "*[S]ince the loss-given-default and expected-loss results for project finance loans are lower than corporate finance loans of an equivalent rating, less capital is required to reserve against their expected losses.*"

[510] A CDO is a transaction which involves repackaging the risk of a portfolio of financial assets. This risk is transferred to an SPV, either by transferring the portfolio to the SPV or using credit derivative techniques. The risk is then sold to the capital markets by a way of the issuance of securities by the SPV, whereby investors in those securities bear the risk of losses suffered by the portfolio (see Annex 1 for

the first portfolio of project loans in 1998, later followed by other banks. Sponsors benefit from securitization by gaining quicker access to funds, while banks benefit by increasing the speed of lending and useful instruments in order to comply with regulatory capital requirements and to increase funds available to finance infrastructure and development projects. As asserted by Buscaino et al. (2009) "*... PF CDOs still remain a valuable means to respond to the unmet need for infrastructural development funds considering future reopening of structured credit market.*" Although the referred benefits, there have been few securitized transactions, as a result of the lack of sufficient data available to banks and rating agencies on loss characteristics.[511] Additionally, project loans securitization will remain difficult, and institutional investors are going to be reluctant to enter the market after the financial 2007/2008 turmoil.

further discussion of securitization and CDOs). An ordinary CDO deal consists of a mix of loans, bonds, and other type of securities. In this case, CDOs are associated to PF loans only.

[511] Structuring these type of deals is more complex than tradition CDOs. Buscaino et al. (2009) point out four main reasons: (1) in traditional CDOs, the assets included in the pool are usually more homogeneous than in project CDOs; (2) reaching an appropriate size for the pool of assets is not as easy as for traditional CDOs; (3) the intrinsic complexity of project finance transactions; and (4) the definition of credit events for the PF loans can be problematic, given the different nature of the projects in the pool.

Annex 3: Structured Leasing Transactions

What Is a Leasing Transaction?

Fabozzi et al. (2006) define leasing as "*... a contract over the term of which the owner of the equipments permits another entity to use it in exchange for a promise by the latter to make a series of payments. The owner of the equipment is referred to as the lessor. The entity that is being granted permission to use the equipment is referred to as the lessee.*" Based on the idea that earnings are originated from the use of an asset, not its ownership, leasing is commonly considered as an alternative method of financing.[512]

It is possible to identify the following steps in the design of a leasing transaction: (1) the lessee identifies the equipment needed, the model and the manufacturer; (2) the lessee defines the features desired in terms of warranties, installation, services, etc.; (3) the lessee defines the price; (4) the lessee enters into a lease agreement with the lessor, in which they define the length of the lease, the rental, if installation charges should be included in the lease, and other optional characteristics; (5) the lessee assigns its purchase rights to the lessor, who buys the equipment as specified by the lessee; (6) the lessor pays the price for the equipment and the lease enters into effect; (7) at the end of the contract, the lessee usually has the option to renew the lease, to buy the equipment, or to terminate the agreement and return the equipment.[513]

Equipment leases can be classified as (1) *Nontax-Oriented Leases* or *Tax-Oriented Leases*; (2) *Single-Investor Leases* or *Leveraged Leases*; and (3) *Full Payout Leases* or *Operating Leases*.[514] If a lease transaction is classified as a *conditional sale lease* or *nontax-oriented lease*: (i) all of the benefits and risks are substantially transferred to the lessee; (ii) the purchase or renewal option is not based on fair market value of the equipment at the time of exercise; (iii) the lessee depreciates the property (treated as

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512 According to Fowkes (2000) "*[L]easing can and has been used to finance all types of assets including, but not limited to, industrial facilities (manufacturing, power generation, etc.), real estate (office, warehouse, retail locations, etc.), and equipment (manufacturing, transportation, etc.).*" Similarly, Fabozzi et al. (2006) point out that "*[N]early asset that can be purchased can also be leased, from aircraft, ships, satellites, computers, refineries, and steam-generating plants, on one hand, to typewriters, duplicating equipment, automobiles, and dairy cattle, on the other hand.*"

513 It is important to notice that the option selected by the lessee define (1) the lease nature for tax purposes, and (2) the lease classification for financial accounting purposes.

514 For a further discussion of lease typologies see, among others, Caselli (2005) and Fabozzi et al. (2006).

owned) for tax purposes; (iv) the lessee deducts the interest portion of the lease payments as an expense; and (v) the lessor treats the transaction as a loan.[515] Conversely, if a lease transaction is classified as a *tax-oriented true lease*: (i) the lessor claims and retains tax benefits resulting from equipment ownership – depreciation cost deduction; (ii) the lessor transfers to the lessee a portion of those benefits in the form of reduced lease payments – via interest rate (or credit spread) reduction; (iii) the lessee deducts the full lease payment as a cost; (iv) the lessor owns the leased equipment at the end of the lease term – the lease contract has no purchase option or a purchase option based on the market value. As asserted by Fabozzi (2006), "*[T]he principal advantage to a lessee of using a true lease to finance an equipment acquisition is the economic benefit that comes from the indirect realization of tax benefits that might otherwise be lost because the lessee cannot use the tax benefits. This occurs when the lessee neither has a sufficient tax liability, nor expects to be able to fully use the tax benefits in the future if those benefits are carried forward.*"[516]

Single-investor leases and *leveraged leases* are two categories of true leases. The first category is a two-party transaction in which the lessor purchases the leased equipment with its own funds. A leveraged leasing is similar to a single-investor lease – in terms of equipment selection and negotiation (rentals, options, responsibility for taxes, insurance, and maintenance) – but with low cost, when compared to other methods of finance and "*... appreciably more complex in size, documentation, legal involvement, and, most importantly, the number of parties involved and the unique advantages that each party gains.*" [Fabozzi et al. (2006)]. Usually offered by corporations and financial institutions (tax benefits available to individual lessors are more limited), in a leveraged lease, the lessor – which provides only 20% to 30% of the capital needed to purchase the equipment and the remainder is borrowed from institutional investor on a nonrecourse basis to the lessor – claims all of the tax benefits related to the ownership

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515 In these circumstances, the lessor "*... cannot offer the low lease rates associated with a true lease because the lessor does not retain the tax benefits available to the owner of the equipment.*" In United States of America the Internal Revenue Code (IRC) establish requirements for a lease to be treated as a true sale. The distinction between tax-oriented and nontax-oriented true leases is the type of purchase option – conditional sale leases have nominal fixed-price options while true leases have market-value purchase options.

516 One of the mostly common motivations for using structured leasing is the possibility of the lessee to obtain a lower funding cost *vis-a-vis* borrowing directly from a financial institution. This reduction comes from the fact that when the lessee is unable to generate a sufficient tax liability to currently use all tax benefits, the cost of owning the equipment is higher than leasing it.

of the equipment and offers the lessee much lower lease rates when compared to *single-investor lease*.

Full payout leases, in contrast to *operating leases*, are basically financing transactions. An *operating lease* transaction is a true sale lease for tax purposes and thus the lessee can deduct the lease payments and the lessor is entitled to all tax benefits related to the equipments' ownership. For financial accounting purposes, an *operating lease* is not disclosed in the lessee balance sheet as financial obligations – the lease equipment is not capitalized and the lease obligation is not shown as a liability on the balance sheet.[517] However, the lessee must disclose information about the lease transaction on footnotes to its financial statements.[518] As pointed out by Caselli (2005), the "*... increased tax benefits afforded by operating leasing have provided a strong stimulus to create 'structured' transactions that give operating leasing the same characteristics as true financial leasing.* [The so-called…] *synthetic leasing transactions.*"

While there is an extensive literature on leasing, most of it focuses on the differential tax position of the lessee and the lessor as the primary rationale for leasing [e.g. Bower (1973), Miller and Upton (1976), Brealey and Young (1980), Smith and Wakeman (1985), and Brick, Fung, and Subrahmanyam (1987)].[519] Miller and Upton (1976) conclude that no financial advantages accrue from leasing. Contrary, Lowellen, Long, and McConnell (1976) and Myers, Dill, and Bautista (1976) argue that, under a set of assumptions, there is a potential for gains in valuation for the firm involved in leasing because government can suffer a loss in taxes. Graham et al. (1998) show a negative relationship between operating leases and tax rates, and a positive relationship between

[517] For accounting purposes, a lease can be classified as either an operating lease or a capital lease. According to FASB Statement No. 13 "*[A] lease that transfers substantially all of the benefits and risks incident to ownership of property should be accounted for as the acquisition of an asset and the incurrence of an obligation by the lessee.*" Thus, all other leases should be accounted for as operating leases. FAS 13 specifies that if one of the following four criteria are met for a noncancelable lease at the date of the lease agreement, the lease is to be accounted for as a capital lease: (1) the lease transfers ownership of the property to the lessee by the end of the lease term; (2) the lease contains a bargain purchase option; (3) the lease term is equal to 75% or more of the estimated economic life of the leased property; (4) the present value of the minimum lease payments (excluding executor costs) equals or exceeds 90% of the fair value of the leased property.

[518] An operating leasing transaction in theory has a greater 'tax acceleration' than financial leasing.

[519] Krishnan and Moyer (1994) present a very concise and complete literature review on this subject.

debt levels and tax rates. Eisfeldt and Rampini (2009) argue that the benefit of leasing is that the repossession of leased assets is easier than foreclosure of secured loans.[520]

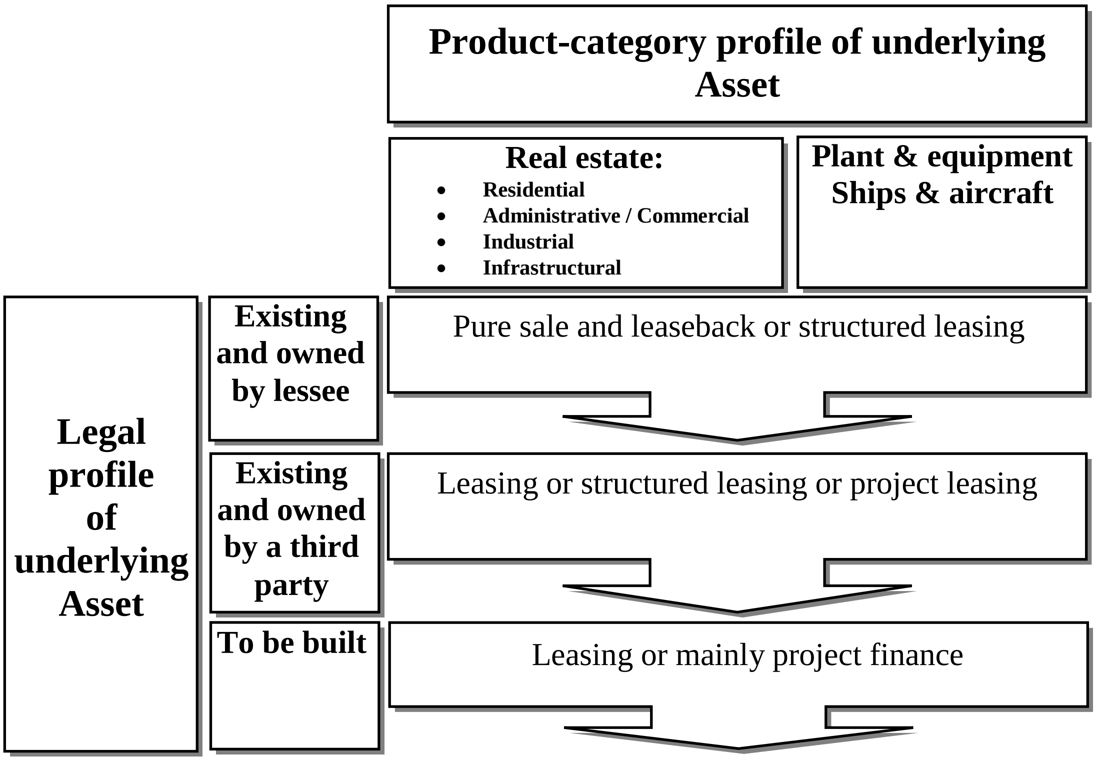
Some authors study the debt *versus* leasing decision. Ang and Peterson (1984) failed to demonstrate that debt and leasing are substitutes and found instead a complementary relationship. Although Lewis and Schallheim (1992) found similar results, Marston and Harris (1988), and Adedeji and Stapleton (1996) support substitutability. More recently, Mehran et al. (1997) presented a mixed evidence and Beatti et al. (2000) argue that leasing and debt are partial substitutes.[521]

Basic Characteristics of Structured Leasing Transactions

Structured leasing is a specific and recent type of transaction, confirmed by the fact that references to it have only appeared recently. As pointed out by Caselli (2005) "... *structured leasing was recognized as new transaction and an independent form of leasing within the structured finance and asset finance sector.*" Additionally, banks and sponsors try to protect their expertise in the sector, believed to offer a competitive advantage.

It is a very versatile instrument that "*... enables the lessee to position the deal in an optimal manner in relation to cash flow structure, its sustainability over time and the distribution of tax benefits.*" [Caselli (2005)]. As in other tax-based techniques, the implementation of a structured leasing transaction is more significant when the value of the asset is large and allows for a potentially greater tax benefits' appropriation. Considering the nature and the role of the asset, which affects the financial flows and risk set-up for the transaction, we can identify diverse structured leasing transactions. Thus, bearing in mind the asset nature in terms of product category, real estate can be residential, administrative, commercial, industrial or infrastructural. In terms of the asset nature, from a legal point of view, it can already exist and be owned by the lessee, can already exist and be owned by a third party, or may even not yet be built. The next figure provides a map of possible structured leasing transactions, where we overlap the two mentioned perspectives.

[520] Lease financing has an advantage over straight debt and even secured debt in that it has a stronger financial claim, being effectively senior to any other financial claim.
[521] See Braund (1989) for a review of the empirical studies on leasing.



Source: Adapted from Caselli (2005).

As asserted by Caselli (2005), "... *while the asset's product category heavily conditions the nature and intensity of financial and equity risks associated with the transaction, the legal profile, if the asset already exists, conditions the financial structure and overall arrangement of the transaction itself.*"[522] This analysis in relation to legal profile and product-category profile can be extended, by considering size and whether the deal is of a domestic or of cross border nature.[523]

Considering the existing literature, structured leasing transactions can fall within one of the two following categories: (1) leveraged leases (or tax or true leases); and (2) synthetic leases (or synthetic structured leases).

[522] Contrary to commercial, industrial, and infrastructural real estate, and above all industrial plant and equipment, residential, and to a degree, administrative real estate, ships and aircraft represent, *ceteris paribus*, a lower financial and equity risk because they tend to have a better defined market value – the secondary market for this assets is wider.
[523] See Caselli (2005) for a further discussion of the structured leasing transaction market, with a focus on European market.

A leveraged lease – a true lease – is similar to a single-investor lease (also called nonleveraged leases or direct leases) but more complex in size and in the number of involved parties – it involves a minimum of three parties with diverse interests: a lessee, a lessor, and a nonrecourse lender.[524] In a leveraged lease (sometimes called a three-party transaction) the lessor becomes the owner of the leased equipment by providing a fraction of the capital necessary to purchase the equipment. The rest "*... of the capital (70% to 80%) is borrowed from institutional investors on a nonrecourse basis to the lessor…* "[525] and the lease all-in cost varies with the credit standing of the lessee and with the risk of the transaction [Fabozzi et al. (2006)].[526]

The 'leverage' in leveraged leases comes from the fact that: (1) the lessor provides only 20% or 30% of the capital needed to purchase the equipment and stay at risk only for that portion; (2) the lessor can claim all of the tax benefits related to ownership – a leveraged lease is always a true lease; and (3) the lessor has the right to 100% of the residual value provided by the lease.[527] It is this leverage that allows the lessor to offer the lessee a lower lease rate than the lessor could offer under a nonleveraged lease or direct lease – the equity investor passes a portion of his tax benefit back to the lessee in the form of reduced lease payments.[528] Leveraged transactions tend to be used in markets offering specific tax advantages to leveraged leasing transactions. Caselli (2005) argue that "*[T]his occurs mainly in two different situations: in international cross-border leasing, and when trusts are used.*"[529]

[524] See, e.g., Shank and Gough (1999), Amembal (2000), Boobyer (2003) and Deo (2009) for a discussion of the economics of leveraged leasing.
[525] As asserted by Fabozzi et al. (2006), in a leveraged lease the largest part of the "*... debt is raised on the private placement market at little or no premium over what the lessee would expect to pay directly for such debt. The sources include insurance companies; pension plans; profit-sharing plans; commercial banks; finance companies; saving banks; domestic leasing companies; foreign banks; foreign leasing companies; foreign investors; and institutional investors.*"
[526] A guarantor of the lessee obligations – a lessees' parent or sister company, a third party, or a government agency – may be necessary if the credit of the lessee is insufficient to support the transaction.
[527] See Fabozzi et al. (2006) for a description of the various steps and milestones in structuring, negotiating and closing leveraged lease transactions.
[528] In a large leverage lease – several owners and lenders are involved – an owner trustee is usually constituted to hold title to the equipment and represent the owners or equity participants.
[529] Cross-border leasing refers to German (GELL - German Leveraged Leasing), French (FDDL - French Double Dip Leasing), US (USPL - US Pickle Leasing), and UK (BDDL – British Double Dip Leasing) markets where its use "*... offers specific tax advantages to the lessor, making the transaction more attractive both for the foreign lessee and for potential financiers of the leveraged transaction, who can 'participate in' the increased tax benefits produced by the deal.*" Cross Border Leases have become a source of financing for European Companies. The U.S. Cross Border Lease (closed on a variety of assets) is structured to benefit from tax arbitrage between US and an European Lessee [see, e.g., Wanzenboeck

When a sponsor is facing low expected marginal tax rates, a leveraged leasing may provide the lowest after-tax cost of funding. Additionally, if a sponsor cannot efficiently use the maximum depreciation or interest deduction benefits associated with tax ownership of assets, an institutional equity investor who can efficiently use these benefits may be willing to give back a portion of these benefits to the sponsor in the form of lower lease payments. Lesses who foresee that they may not be able to use the tax benefits of ownership (e.g., tax depreciation) generally tend to use leveraged leases. Though, as referred by Fowkes (2000), "*[F]ully taxable sponsors seeking the earnings benefits associated with operating leases should consider synthetic leases.*"

Having in mind that, in a leveraged lease, the lessee selects the assets, enjoys the benefits from their use – although it loses the tax benefits – and enjoys the lower lease rates, Exhibit 1 depict the activities and cash flows involved. The main steps in the implementation of a leveraged leasing transaction are: Step 1: the lessor establishes an SPV or a Trust – usually a bank, also known as the owner trustee or equity trustee; Step 2: the lessor makes an equity investment (typically 20% or more of the purchase price) in the SPV; Step 3: the lessee assigns the purchase agreement to the owner trustee; Step 4: the trust borrows the remaining 80% or less from lenders;[530] Step 5: the lessor purchases the asset with 100% funding (a mix between equity and debt) from the manufacturer; Step 6: the lessor becomes the owner of the asset; Step 7: the lessee is being granted the permission to use the asset; Step 8: the lessee makes a series of payments – lease payments.

(2001) for further discussion of U.S. Cross Border Lease]. When the leasing is structured based on the interposition of a trust between the lessor and lessees the tax benefits produced are duplicated – nowadays it is possible to identify the Trust Leasing and the Japanese Leveraged Leasing [see, e.g., Deo (2008) for a explanation of Cross-Border Japanese Leveraged Leases].

[530] As referred by Deo (2009), the borrowing process is "*... accomplished as follows: the lenders select a trustee (usually a bank), also known as an indenture trustee or loan trustee; on behalf of the lender, the indenture trustee issues a loan to the owner trustee…*" The loan has the following characteristics: (1) is secured by a mortgage of the asset; (2) the income from the lease is assigned to the indenture trustee; and (3) a guarantee of payment may be issued by the lessee.

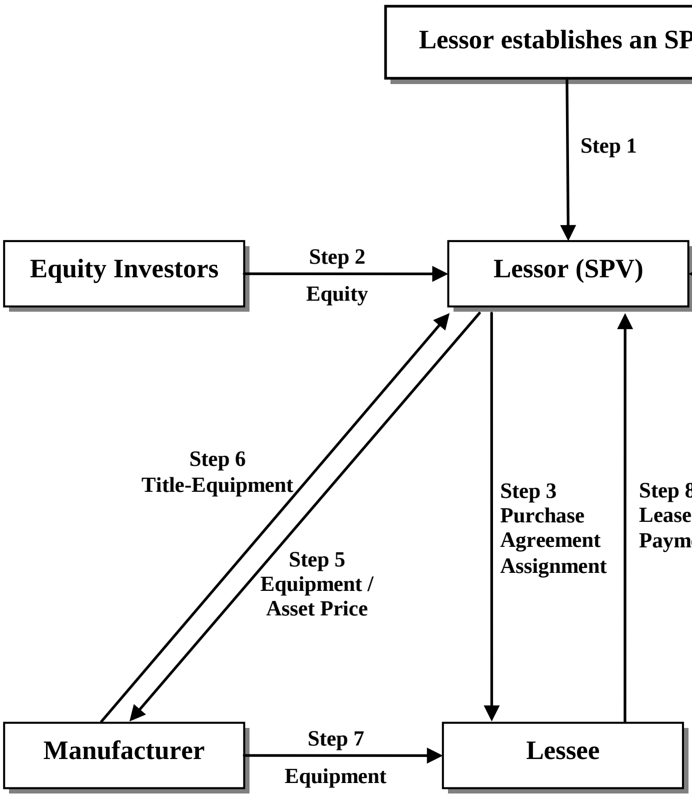


Exhibit 1: Activities and cash flows involved in a Leveraged Lease.
Source: Adapted from Deo (2009).

However, Fabozzi et al. (2006) point out that "*[O]ne of the drawbacks of a true sale of equipment for many lessees (and particularly those able to utilize tax benefits associated with equipment ownership) is the possible loss to be experienced when the true lease terminates and the equipment may have to be acquired from the lessor.*" The synthetic lease was developed to solve this limitation, by providing at the same time off-balance sheet treatment of the lease obligation and protecting the lessee's cost of acquiring the equipment when lease terminates.[531] Thus, synthetic leases are operating leases for accounting purposes and financing operations for tax purposes; i.e., they are off-balance sheet leases, in which the lessee remains the owner of the financed assets and retain the tax benefits associated with ownership, while simultaneously enjoying the benefits of an operating lease. To be classified as an operating lease, a synthetic lease is

[531] Weidner (2000) defines synthetic lease as a "*... method used to provide off-balance sheet financing to a corporate entity for the acquisition and development of a commercial facility or site, with substantial credit support for debt issued by or through an investor or capital source, usually a financial institution.*" A Synthetic lease transaction if typically structured using an SPV that is created solely for the purpose of a transaction or into a series of transactions.

structured on the basis of a lease agreement between the lessee (as the user or owner) and the lessor (as an investor), which complies with the requirements established by FAS 13 and related accounting rules. For tax purposes, a synthetic lease is structured so that the lessee may reclaim that it is, in substance, the owner of encumbered property, with a rental obligation that should be treated as debt service. Additionally, the lessee claims a depreciable interest in the asset and a depreciable basis that includes the portion of the cost financed with borrowed funds.[532]

A synthetic leasing transaction is based on the establishment of an SPV exclusively for the transaction. This means that the SPV is the owner of the asset / equipment, which then proceeds to organize the leasing with the lessee and to raise the funding needed to purchase the asset itself. According to Caselli (2005), the motivations behind synthetic leasing are: "*... a search for countries in which to domicile the SPV enabling greater tax benefits to be obtained than in the country of origin; the optimization of tax benefits by transforming financial leasing into operating leasing.*"[533] In the first motivation, the SPV's income statement will comprise: (1) depreciation of the asset; (2) financial costs for servicing the debt; and (3) installments received from leasing contracts.[534] In the second case, the use of an SPV is justified (apart from the reasons referred for the first case) to implement an operating leasing than a financial leasing and, consequently, increasing the tax benefits from the transaction. This is particularly relevant when the lessee wants to set up an off-balance sheet transaction to improve its structural margin. According to Fowkes (2000), "*[S]ynthetic leasing may be the most cost-effective option for lessees with high marginal tax rates.*"

Exhibit 2 depicts the activities involved in a synthetic lease structure. The core steps in the execution of a synthetic lease transaction are: Step 1: the SPV is incorporated; Step 2: the lessor, together with the lessee (typically a very small part of the SPV's equity), makes an equity investment in the SPV; Step 3: the SPV borrows the remaining from

[532] As referred by Weidner (2000), "*[E]specially in the early years of the financing arrangement, the combined depreciation and interest deductions typically exceed the rental deduction.*"

[533] Altamuro (2006) asserts that the proponents of synthetic lease argue that economic benefits outweigh the costs of complexity and opacity, while critics argue that the economic benefits of these off-balance sheet transactions "*... are the result of short-sighted opportunistic behavior by managers that lead to wealth extraction at the expense of other groups of stakeholders.*"

[534] The lessee will select the most advantageous country from a tax treatment point of view, in which there is a significant difference between installments received by the SPV and the depreciation of the asset. Thus, the lessee can reduce the transaction all-in cost.

lenders;[535] Step 4: the SPV purchases the asset price from the supplier; Step 5: the lessor becomes the owner of the asset; Step 6: the SPV signs a leasing contract with the lessee giving the permission to use the asset; Step 7: the lessee makes a series of payments – lease payments; Step 8: the SPV uses the periodic installments to repay the lenders; Step 9: the lessee exercises a the call option on the asset or on the SPV shares.[536]

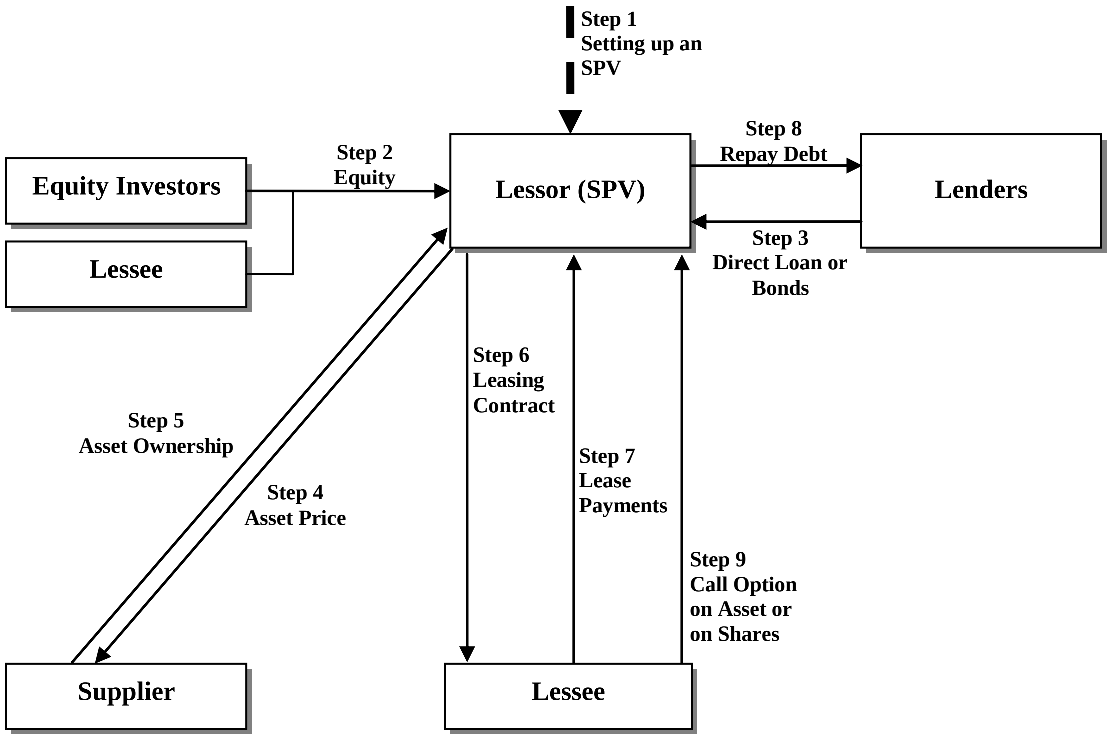


Exhibit 2: activities and cash flows involved in a Synthetic Lease.
Source: The Author.

Fowkes (2000) summarizes the two types of structured leasing in a very concise way. He argues that with a leveraged lease, which is structured as a lease for tax purposes, the tax benefits of depreciation and interest deduction are retained by the lessor but partially passed back to the lessee through lower rents. A synthetic lease is an operating lease for accounting purposes but structured as a financing for tax purposes. Both use a SPE to act as a owner (or lessor) of the assets, and achieve off-balance sheet operating lease treatment for the lessee under FAS 13.

535 The Lenders can fund the debt capital by a direct loan made through a pool or by issuing bonds.
536 At the end of the transaction the lessee may, if it wishes, exercise the call option on the asset owned by the SPV or on shares in the SPV, so becoming the owner.

Structured Leasing and Taxes

The review of factors underlying the growth of the leasing market highlighted the centrality of taxation. With structured leasing, lessees can use tax benefit in the most appropriate manner to achieve their economic and financial objectives. The regulatory framework is crucial when we are dealing with this type of transactions. Thus, understanding the tax framework in force in the country concerned allows the perception of economic maneuvering room of structured leasing. In Europe, the regulatory framework is quite well-defined and stable.[537]

Concluding remarks

According to Caselli (2005) there are three macro-trends helping to define a scenario and explain the structured leases' market evolution: (1) tax regime – a significant change in tax framework (at home and overseas) strongly increases or decreases the size of the market; (2) private banking and family office – the growth of the real estate leasing market is highly driven by these operators, who manage real estate investment portfolios; and (3) international and synthetic-type transactions – "*[T]he effective match between the leasing instrument and requirements of large real estate deals (in developing countries and others too) is a factor representing a substantial and structural stimulus for market growth.*"

Empirically, Slovin et al. (1990) study the impact on share prices of announcements of sale-and-leasebacks. They show that this type of transactions enhance lessee value but have no significant effects on lessors.[538]

[537] See Caselli (2003) for an comprehensive evaluation of tax effects on corporate financing decisions.
[538] In a sale-and-leaseback transaction, a firm sells an asset it owns to another entity and at the same time leases it back from the new owner (the lessor). The lessor obtains the benefits from ownership, namely: depreciation allowances and tax credits. According to Slovin et al. (1990), the principal motive for such transactions is the "*... potential for differences in applicable tax rates for lessees and lessors to create value enhancement.*"

Annex 4: Leveraged Acquisitions

Definition

Leveraged acquisitions refer to the class of operations which belong to a larger family called merger and acquisition (M&A) activities.[539] Capizzi (2005) refers that "*[L]everaged Acquisitions constitute an important category in the area of structured finance, namely those that result in leaving the acquired company with a debt ratio that is higher than what it was before the acquisition.*" With regard to the literature and the business area of leveraged acquisitions, the author presents the following typologies: (1) Leveraged Buy-Out (LBO); (2) Management Buy-Out (MBO); (3) Management Buy-In; (4) Buy-In Management Buy-Out (BIMBO); (5) Family Buy-Out (FBO); (6) Workers Buy-Out (WBO); (7) Corporate Buy-Out (CBO); and (8) Fiscal Buy-Out (FBO).[540] However, in practice, it is hard to find any one of the referred operations in 'pure form'; e.g., it is easy to find LBOs that have simultaneously characteristics of an MBO (the proponents are a group of managers of the target firm) and of a FBO (developed with the aim of creating interest tax shields for of the acquirer).

There are a number of authors who have studied this subject in the field of Corporate Finance. Perhaps the most studied type of leveraged acquisitions are LBOs.[541] They have been subject to wide discussion, concerning problems of financial structure, and the financial and economic performance of firm. Although the higher debt typical to such financing transactions allows for the exploitation of the financial leverage effect, these operations increase the financial risks, exposing management to pressures to guarantee the repayment of the debt and the debt service. Thus, the literature "... *is*

[539] M&A activities can be viewed as those operations that affect permanently the ownership structure of one or more enterprises. Among the most diffusive types of operations we can find [Arzac (2005)]: fusions; splits; exchange of shares; equity carve-outs; public offers of purchase and exchange; restructurings of businesses in crisis; and initial public offerings.

[540] See, among others, Renneboog and Simons (2005) and Capizzi (2005) for further details on leveraged acquisitions (typologies and European market evolution). When the incumbent management team takes over the firm, the LBO is called a management buyout (MBO). If an outside management team acquires the firm and takes it private, we refer to this transaction as a management buy-in (MBI). When the owners of a delisted firm are solely institutional investors (e.g., private equity firms) we call these transactions as institutional buyouts (IBOs).

[541] Considering that LBOs are the most widespread category of such transactions, from now on we will use indistinctly throughout the dissertation Leveraged Acquisitions and LBOs. See, e.g., Jensen (1993), Thompson and Wright (1995), and Nikoskelainen and Wright (2007) for literature reviews on LBOs.

concentrated particularly upon the determination of the ideal characteristics that need to be possessed by a firm, for it to be a good candidate for a leveraged acquisition, and also, on estimating the value for the shareholders of such an acquisition.” [Capizzi (2005)].

Leveraged Buy-Out (LBO): Major Characteristics

Weston et al. (2001) present a LBO as “*... the purchase of a company by small group of investors using a high percentage of debt financing.*” According to Arzac (2005) a LBO is a leveraged acquisition transaction in which a “*... a group of investors finance the acquisition of a corporation or division mainly by borrowing against the target´s future cash flows.*” The promoters, which include a sponsor and, frequently, existing management, organize and implement the buy-out.[542] A similar definition is presented by Kaplan and Strömberg (2009) which state that in a LBO “*... a company is acquired by a specialized investment firm using a relatively small portion of equity and a relatively large portion of outside debt financing. The leveraged buyout investment firms today refer to themselves (and are generally referred to) as private equity firms.*”[543] Especially when financial groups akin to private equity funds, venture capital companies or other types of buyout specialists are involved, the LBO transaction is expected to be reversed with a public offering. The aim is to increase the profitability of the company taken private and thereby increase market value.

It is possible to find certain unique characteristics in an LBO transaction, namely: (1) usually require the incorporation of an SPV (sometimes referred to as ‘NewCo’ or the acquirer) for the transfer of the ownership which, after being capitalized by the proponents, will launch the offer for the company to be acquired – the so-called ‘target firm’;[544] (2) the acquisition happens off-balance sheet for the proponents; (3) the bulk of

[542] When managers or executives of the company are an important part of the promotion group, the LBO is called a Management Buy-Out (MBO) and it results in a significant increase in the ownership of equity shares by managers.

[543] In a LBO the private equity typically buys the majority control of the target firm – usually an existing or mature firm. As pointed out by Kaplan and Strömberg (2009), private equity “*... is distinct from venture capital firms that typically invest in young or emerging companies, and typically do not obtain majority of control.*” See Kaplan and Strömberg (2009) for a further discussion of private equity firms, funds, and transactions.

[544] The offer can be public, in the case that the target firm is quoted or, otherwise, through private negotiations.

the capital needed for the operation is supplied by the debt securities provided by banks and financial intermediaries – equity raised by the SPV represents a slight part of the resources required;[545] and (4) the debt capital supplied by the banking system is a function of the capacity of the target firm to generate cash flows.[546]

According to Rosenbaum and Pearl (2009) "*[I]n a traditional LBO, debt has typically comprised 60% to 70% of the financing structure, with equity comprising the remaining 30% to 40%.*" Given the inherently high leverage associated with an LBO, debt portion of the LBO financing structure may include a broad array of loans, securities, or other debt instruments with varying terms and conditions. Exhibit 1 presents the primary types of LBO financing sources by capital structure ranking.

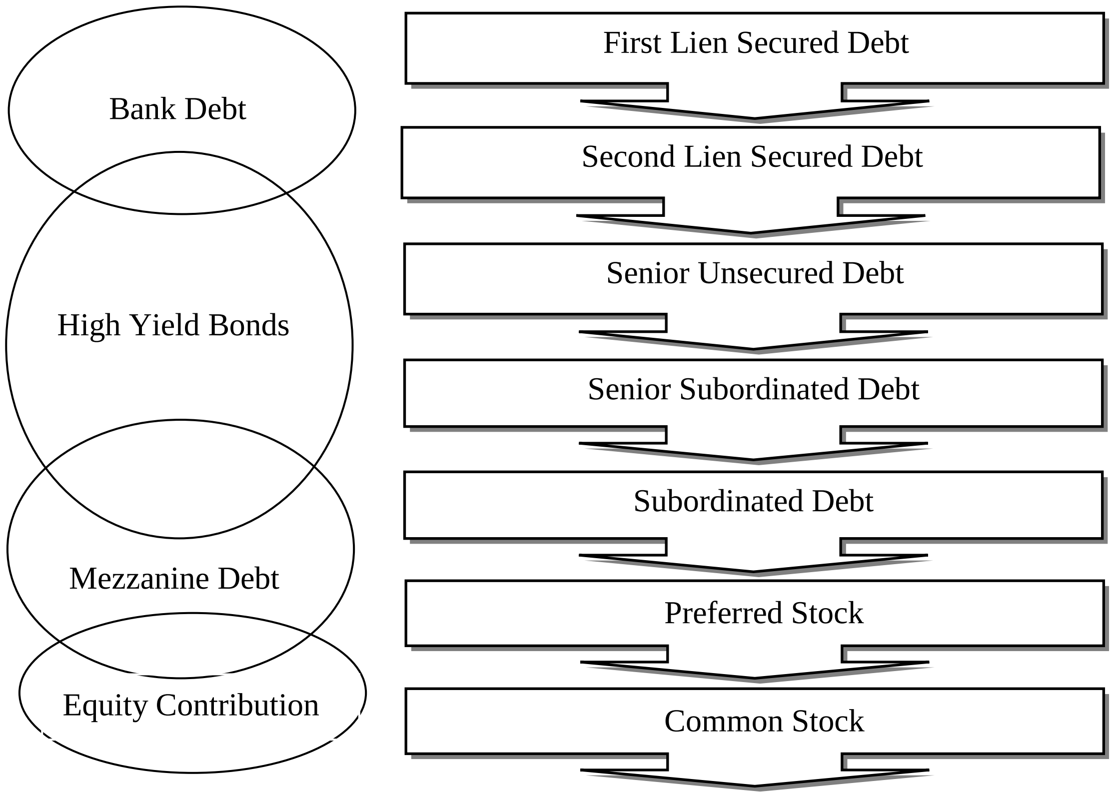


Exhibit 1: Financing sources in an LBO capital structure.
Source: Adapted from Rosenbaum and Pearl (2009).

[545] The 'leverage' in LBOs comes from the fact that the transaction is very 'pushed' by the recourse to indebtedness. This allows the exploitation of financial leverage benefits – allows for sponsors to achieve acceptable returns – but introduce a higher intrinsic structural risk when compared to other M&A transactions.

[546] According to Capizzi (2005), "*...the banks finance the acquirer on the basis of the residual debt capacity of the acquired firm and its consequent capacity to repay the debt and the servicing charges for the same.*" Hence, only target firms that are able to repay the financial obligations of the acquisition are good candidates for a leveraged acquisition.

In an LBO, debt always includes two types of loans: (1) a senior and secured loan portion, purchased by banks (mainly in the 1980s and 1990s) and institutional investors (hedge funds and collateralized loan obligations managers); and (2) a junior and unsecured portion, financed by high-yield bonds or 'mezzanine debt'.[547] The equity contribution is usually provided by private equity firms and by the new management team that typically contributes to the new equity, although with a small fraction.[548]

The implementation process of an LBO can be divided into several phases: (1) identification and selection of the target company; (2) identification of the financial intermediary to assist the buyer;[549] (3) development of the business plan (summarizes the sustainability of the NewCo business model and the financial feasibility of the transaction); (4) identification of the investors to share the capital on the NewCo (the work of the financial advisor in involving the industrial of financial investors becomes crucial); (5) capitalization of the NewCo (usually a company incorporated for the deal – an SPV);[550] (6) negotiation of the lines of credit needed to add to the capital of the SPV, to ensure the payment of the price accepted by the owners of the target firm;[551] (7) the NewCo acquires all the target´s shares; and (8) merger of the target with the NewCo. Thus, the scheme of a typical LBO transaction can be summarized through the following steps (as can be seen in Exhibit 2): Step 1: creation of a new company (NewCo or SPV) and equity raising; Step 2: debt financing based on bridge loans

[547] Mezzanine debt is debt that is subordinated to the senior debt.

[548] See, e.g., Axelson, Jenkinson, Strömberg, and Weisbach (2008) for a detailed description of capital structures in LBOs.

[549] As asserted by Rosenbaum and Pearl (2009), "*[I]nvestment banks traditionally play a critical role in this respect, primarily as arrangers/underwriters of the debt used to fund the purchase price.*" The activity of structuring the transaction performed by the financial advisor is critical. Firstly, because it has to consider carefully how the target firm will survive with the heavy debt burden and a financial leverage above that which is physiologically acceptable for working in a certain economic context. Secondly, the business plan, prepared by the advisor on the basis of the directions provided by the proponents, is fundamental in providing information on the advantages, in monetary terms, of the subjects participating in the operation.

[550] By changing the relative participation of debt and equity in the capital structure, an LBO redistributes returns and risks among providers of capital.

[551] Traditionally, the lenders request that the shares of the target firm or it real assets be considered as collateral. LBOs are financed mainly with secured bank debt and unsecured subordinated debt – big transactions may be able to raise subordinated debt in the public high yield marker, while small transactions rely on secured bank debt and private placement of subordinated debt. Hence, it is necessary to involve a pool of financial investors holding the debt capital in the initiative via a syndicated loan.

financial contracts; Step 3: acquisition of the target; Step 4: merger of the SPV with the target; and Step 5: new debt contracts against the new post-LBO Target company.[552]

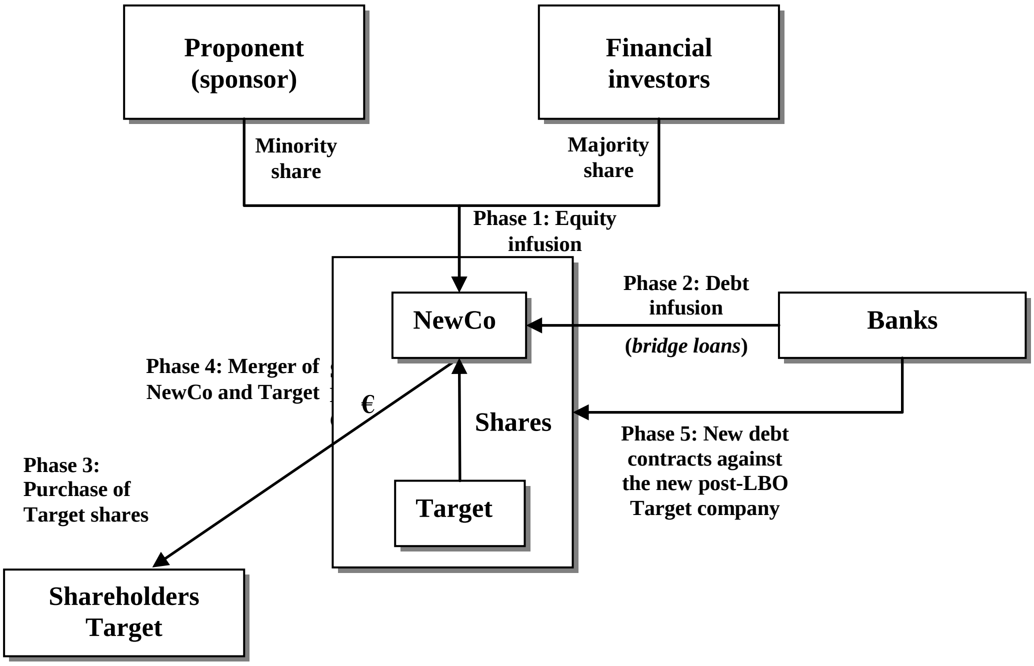


Exhibit 2: Activities and cash flows involved in an LBO transaction.
Source: Adapted from Capizzi (2005).

The Participants in LBO Market

There are five key participants in an LBO: (1) financial sponsors; (2) investment banks; (3) bank and institutional lenders; (4) bond investors; and (5) target management. Prior to the description of the role played by each participant, it is important to notice that promoters would want to organize an LBO only if they expect to obtain a significant gain from the transaction; i.e., if they can increase free cash flows above the level expected by the seller.

The term 'financial sponsor' refers to institutional investors in risk capital; i.e., those entities investing in risk capital of non financial companies, that is: private equity firms; merchant banking divisions of investment banks; commercial banks; hedge funds;

[552] See Weston et al. (2001) for a description of the critical stages in a typical LBO.

closed end mutual funds; venture capital funds; and special purpose acquisition companies.[553] Private equity funds have taken an increasing magnitude in the LBO market. Venture capital funds are operators with specific competences who participate in the capital of recent small/medium enterprises, in order to help them during the difficult startup phase. A private equity firm, which serves as the fund's general partner, raises equity capital through a private equity fund. Most of these funds are 'closed-end' vehicles organized as limited partnerships in which the general partners manage the fund and the limited partners provide most of the capital – typically institutional investors, such as corporate and public pension funds, insurance companies, and wealthy individuals.

Investment banks are key participants in LBOs, both as advisors and as providers of financing. As referred by Rosenbaum and Pearl (2009), they "*... perform thorough due diligence on LBO targets (usually alongside their sponsor clients) and go through an extensive internal credit process in order to validate the target's business plan.*"

Banks and institutional lenders are the debt providers in a LBO structure. While bank lenders – commercial banks, savings and loan institutions, and finance companies – traditionally provide short-term and amortizing loans, institutional lenders – hedge funds, pension funds, prime funds, insurance companies, and structured vehicles (e.g., CDO funds) – usually provide debt for longer-term and limited amortization loans.[554]

High yield bonds issued as part of the LBO financing structure are purchased by bond investors, which generally include high yield mutual funds, hedge funds, pension funds, insurance companies, and distressed debt funds.

[553] This capital is organized into funds that are usually established as limited partnerships. As explained in Kaplan and Schoar (2003), "*[T]he limited partners (LPs) consist largely of institutional investors and wealthy individuals who provide the bulk of the capital*". According to Axelson et al. (2009) "*[P]rivate equity investments are generally made by funds that share a common organizational structure* […] *The funds are usually organized as limited partnerships, with the limited partners (LPs) providing most of the capital and general partners (GPs) making investment decisions and receiving a substantial share of the profits (most often 20%).*"

[554] Kaplan and Stein (1993) find that banks provided the majority of buyout debt during the 1980s. Similarly, Demiroglu and James (2010) point out that "*... commercial banks have traditionally played an important role in leveraged buyout (LBO) financing.*" They present the following three explanations why LBO firms rely heavily on bank debt: (i) concentrated ownership makes bank loans easier to negotiate; (ii) banks are thought to have a comparative advantage in monitoring; and (iii) when LBOs are financed with more short-term bank debt the incentive effects of debt [Jensen (1986)] are likely to be stronger.

Finally, target management plays a crucial role in: (1) marketing of the target to potential buyers; (2) preparing marketing material and financial information; and (3) holding a meaningful equity interest in the post-LBO company.

Arzac (2005) answer the following question: 'What is an ideal LBO candidate?' The author presents the following desirable characteristics: (1) a firm with predictable revenues and cash-generating capacity; (2) competent management that understands the demands imposed by the financial structure of the LBO, as the focus shifts to cash generation and debt retirement; and (c) the nature of the company's assets.[555] Similarly, Rosenbaum and Pearl (2009) argue that firms with relatively stable and predictable cash flows and significant assets are good candidates for LBOs, because they can bear larger quantities of debt.[556]

Advantages and Disadvantages of an LBO

Empirical studies report that the premiums paid are 40% or more of the market price of the stock a month or two before the announcement of the buyout [Weston et al. (2001)]. Thus, understanding the sources of these gains is a key aspect. The rationale for the emergence of LBOs can be explained by the following sources of wealth gains: (1) tax savings [e.g., Weston et al. (2001), Renneboog and Simons (2005), Kaplan and Strömberg (2009), and Guo et al. (2011)];[557] (2) agency costs reduction [e.g., Opler and Titman (1993), Weston et al. (2001), Renneboog and Simons (2005), Kaplan and Strömberg (2009), and Guo et al. (2011)];[558] (3) wealth transfers [e.g., Weston et al.

[555] It is important to notice that LBOs are transitory forms of ownership. During the LBO, management attempts to improve operations, and the sponsor looks for a transfer of ownership to a more permanent owner. Exit can be made via: (1) an IPO; (2) a sale to strategic buyer; and (3) another LBO (to provide some liquidity to the sponsor and higher ownership to management). See Arzac (2005) for further details.

[556] For Rosenbaum and Pearl (2009) a firm must have the following characteristics to be "*... a strong LBO candidate: Strong Cash Flow Generation; Leading and Defensible Market Position; Growth Opportunities; Efficiency Enhancement Opportunities; Low Capex Requirements; Strong Asset Base; Proven Management Team.*"

[557] Lowenstein (1985), Kaplan (1989a), and Frankfurter and Gunay (1992) argue that the wealth gains from LBOs are largely the result of interest tax shields related to the high leverage that underlies the transaction. However, (i) the tax gains realization do not require an LBO, (ii) high leverage increases the cost of financial distress, and (iii) LBO's firms assume much more debt as than was necessary to eliminate their tax earnings. Thus, as pointed out by Opler and Titman (1993), "*[T]his suggests that there must also be nontax-related motives for using debt in LBOs.*"

[558] Three important hypothesis can be pointed out: (1) the incentive realignment hypothesis; i.e., the need to realign incentives of managers with those of shareholders is frequently mentioned as a potentially important factor in LBOs transactions [see, e.g., Kaplan (1989b)]; (2) the control hypothesis means that

(2001) and Renneboog and Simons (2005)];[559] (4) better management incentives [e.g., Opler and Titman (1993), Weston et al. (2001), Kaplan and Strömberg (2009), and Guo et al. (2011)];[560] (5) improvement of operating performance and efficiency [e.g., Lichtenberg and Siegel (1990), Weston et al. (2001), and Kaplan and Strömberg (2009)];[561] (6) corporate undervaluation [e.g., Weston et al. (2001), and Renneboog and Simons (2005)];[562] (7) reduction of transaction costs [e.g., Renneboog and Simons (2005)];[563] and (8) takeover defenses [e.g., Renneboog and Simons (2005)].[564]

Kaplan and Strömberg (2009) point out that proponents of LBOs argue that these transactions create economic value by (1) reducing agency problems, (2) increasing operating performance, and (3) increasing interest tax shields.[565] Regarding agency problems, Jensen (1989) and Kaplan (1989a and 1989b) argue that by paying careful attention to management incentives LBOs reduce agency problems between managers and shareholders. Private equity firms typically give the management team a large equity upside through stocks and options and require management to make investment in the company. Additionally, because companies are private, management's equity is

the wealth gains become from the increase in the quality of control – LBO transaction constitute a reunification of ownership and control by mitigating the free-rider problem [Grossman and Hart (1980)] on monitoring managerial actions in public corporations with a dispersed shareholder structure [see, e.g., DeAngelo, DeAngelo, and Rice (1984), Admati, Pleiderer, and Zechner (1994), and Maug (1998)]; and (3) the free cash flow hypothesis suggests that the wealth gains of LBOs are largely the result of the elimination of free cash flow problems – according to Jensen (1986) managers have incentives to retain resources and grow firm beyond its optimal size [see, e.g., Jensen (1986), and Cotter and Peck (2001)].

559 Weston et al. (2001) argue that the payment of premiums in an LBO transaction may represent wealth transfers to shareholders from bondholders, preferred stockholders, employees, and even the government.

560 With an LBO the management's ownership stake increase so that the incentives are stronger for improved performance.

561 Lichtenberg and Siegel (1990) argue that LBOs contribute to a better allocation of resources in the economy by improving the operating performance of the target firm. According to Weston el al. (2001), the decision process can be more efficient under private ownership, which is associated with the delisting of the target firm.

562 Asymmetric information between managers and outsiders about the firm value means that management has superior information and knows the true distribution of future returns. Thus, wealth gains can result from alternative higher-valued use of the firm's assets by management. This is the case in MBOs, where managers of the target can employ specific accounting and finance techniques to depress pre-announcement share prices [see, e.g., Lowenstein (1985), Schadler and Karns (1990), Harlow and Howe (1993), and Kaestner and Liu (1996)].

563 The transaction cost hypothesis suggests that wealth gains from LBOs result from the elimination of the transaction costs associated with the listing of the target firm on the stock exchange.

564 Renneboog and Simons (2005) argue that "*... the takeover defense hypothesis suggests that the wealth gains from going private are the result of the management team willing to buy out the other shareholders in order to stay in control.*"

565 Kaplan and Strömberg (2009) "*... use the terms private equity and leveraged buyout interchangeably.*"

illiquid, what reduces their incentives to manipulate short-term results.[566] The second key ingredient in reducing agency problems is leverage.[567] As pointed out by Kaplan and Strömberg (2009), "*[L]everage creates pressure on managers not to waste money, because they must make interest and principal payments. This pressure reduces the 'free cash flow' problems described in Jensen (1986)…*" Thirdly, private equity investors control more actively the boards of the acquired companies and are more involved in governance.[568] LBOs add industry and operating expertise, creating value to target companies. Private equity firms use their industry expertise and operating knowledge to develop value creation plans to their investments. As referred by Acharya and Kehoe (2008) and Gadiesh and MacArthur (2008), a plan can include: cost cuttings, strategic changes, marketing strategy repositioning, and management changes and upgrades.[569] Finally, the high portion of debt in LBOs gives rise to valuable interest tax deductions. Kaplan (1989a) and Marais, Schipper, and Smith (1989) agree that tax savings are a considerable source of gains.

However, Kaplan and Strömberg (2009) present some disadvantages of LBOs. They assert that critics argue that LBOs take advantage of tax benefits and superior information, but do not create economic value. The same idea is presented by Opler and

[566] As referred by Nikoskelainen and Wright (2007), "*[C]oncentrated ownership provides private equity investors with the ability to monitor and control the strategy of buyout target firm through an active presence on the board of directors.*"

[567] Grossman and Hart (1982) and Jensen (1986, 1989) argue that debt can induce management to act in the interests of investors in ways that cannot be duplicated with optimally designed compensation packages. Guo et al. (2011) examine (for a sample of 192 buyouts completed between 1990 and 2006) whether, and how, LBOs create value. They argue that consistent with the benefits of debt, "*… cash flows gains are greater for firms with greater increases in leverage as a result of buyout.*"

[568] Tirole (2006) argues that LBOs, as governance instruments of the market for corporate control, create "*… a new and superior form of corporate governance.*" Andres et al. (2007) examine a sample of 115 European leveraged going to private transactions from 1997 to 2005 and posit that corporate governance mechanisms – related to free cash flow, shareholder protection, undervaluation and the market for corporate control – are important factors in explaining the short term gains generated by European LBOs. The same line of reasoning is presented by Nikoskelainen and Wright (2007). According to Gertner and Kaplan (1996), and Acharya and Kehoe (2008), LBOs companies boards are smaller and meet more frequently than public companies. Farther, private equity investors quickly replace management with poor performance. Guo et al. (2011) find that cash flow performance increases when the private equity replaces the CEO before or at the time of the LBO.

[569] The empirical evidence on the operations performance of companies shows largely that LBOs are associated with significant operating and productivity improvements. Cumming, Siegel, and Wright (2007) summarize much of this literature and conclude that there "*… is a general consensus across different methodologies, measures, and time periods regarding a key stylized fact: LBOs [leveraged buyouts] and especially MBOs [management buyouts] enhance performance and have a salient effect on work practices.*"

Titman (1993), which refer that "*[C]ritics of LBOs argue that most of the gains to equityholders arise because of tax savings (see Lowenstein (1985)) and the expropriation of nonequity stakeholders (e.g., employees and bondholders) and have expressed concern about the effect of financial distress…*"[570] Cumming and Zambelli (2010) assert that the current criticism of LBOs is associated with: (1) the potential negative impact on the acquired company; (2) the insider managers may hold private knowledge that can be used as insider information in other transactions;[571] and (3) private equity that finance LBOs may weaken the target firms and kill jobs.[572] More recently, particular criticism has been directed at the so-called club deals.[573] Officer et al. (2010) find that "*… target shareholders in club deals receive significantly lower premiums than sole-sponsored LBOs and other merger and acquisition transactions.*"

While agreeing that tax savings are a significant source of gains in LBOs, Kaplan (1989b), Muscarella and Vetsuypens (1990), and Smith (1990) show that wealth is also created. They find cash flow improvements after LBO transaction. Thus, as referred by Opler and Titman (1993), "*… the magnitude of financial distress costs as well as the gains from incentive realignment, may be important factors in determining whether a firm chooses to do an LBO.*" They found out that firms with simultaneously higher cash flows and lower Tobin's *q* are more likely to undertake an LBO, which is consistent with the free cash flow hypothesis.[574] Based on capital structure theory, Roden and Lewellen (1995) argue that the financing decision to be taken by the buyout group will involve a trade-off between leverage-related costs (agency costs of high levels of debt financing and bankruptcy costs) and leverage-related benefits (disciplining effect of

[570] Asquith, Gertner, and Scharfstein (1991), Kaplan and Stein (1993), and Opler (1993) developed academic studies of bankruptcy costs and bankruptcy cost reduction in highly levered transactions. These studies emerged because firms that did LBOs in the late 1980s incurred in financial problems which renewed concerns about potential financial distress costs created by these transactions.
[571] Some authors point out that LBOs benefits are induced by private equity investors superior information on future company performance – incumbent management is a source of this inside information. However, empirical findings are inconsistent with operating improvements being the result of asymmetric information. As referred by Kaplan and Strömberg (2009), "*… the evidence does not support an important role for superior firm-specific information on the part of private equity investors and incumbent management.*"
[572] On the contrary, Amess and Wright (2007) present evidence that "*… LBOs, per se, do not destroy jobs and emphasize the need for more empirical evidence to better address the current international controversy surrounding LBOs.*"
[573] In a club deal two or more private equity firms jointly sponsor a LBO.
[574] The same intuition is presented by Carow and Roden (1997). Additionally, they also show that firms with lower, and therefore greater debt capacity, have higher abnormal returns.

debt on management and the value of tax shields provides by the debt).[575] They found evidence that "*... the financing package is designed systematically to respond to differences across firms in their growth prospects, in the variability of their earnings, in their liquidity characteristics, in their plans to sell assets, and in opportunities to achieve tax savings…*" Therefore, the amount and the profile of cash flow is a matter of concern in structuring the financing package.

The Market for LBOs

We can identify three major stages of LBOs in the United States: (1) the 1980s; (2) the early 1990s; (3) and the mid-2000s.[576] LBOs first appeared as an important phenomenon in the 1980s, to the point that Jensen (1989) predicted that such organizations would ultimately become the dominant corporate organizational form.[577] As private equity firms have become the main equity provider in LBOs[578] and they apply performance-based managerial compensation, highly leveraged capital structures and active governance, Jensen refers to LBOs as superior to those of public corporations with dispersed shareholders, low leverage, and weak corporate governance. However, a few years later, "*[T]he junk bond market crashed; a large number of high-profile leveraged buyouts resulted in default and bankruptcy; and leveraged buyouts of public companies (so called public-to-private transactions) virtually disappeared by early 1990s.*" [Kaplan and Strömberg (2009)]. In the mid-2000s United States and the rest of the world experienced a second LBO boom, with a record amount of capital committed to private equity. However, since 2008, with the financial turmoil in the debt markets, LBOs have declined again. The credit crisis brought collateralized loan obligations (CLOs) to a halt, consequently the LBO market dried up.[579]

[575] According to Roden and Lewellen (1995) "*... the financing choices observed should reflect a trade-off that seeks to match at the margin the benefits and opportunities with the costs and constrains.*"
[576] See Renneboog and Simons (2005) for a description of international trends and regulatory changes in the LBO market.
[577] As pointed out by Opler and Titman (1993), between 1979 and 1989 the market capitalization of public-to-private transactions in the US alone was in excess of $250 billion.
[578] For example, between 2000-2004, the Western European private equity market (including the United Kingdom) had 48.9% of worldwide leveraged buyout transaction value, compared with 43.7% in the United Sates.
[579] CLOs are CDOs backed predominantly by loans. According to Benmelech and Dlugosz (2009) "*CLOs played a key role in financing billions of dollars of private equity firms' leveraged buyouts around the*

In Europe, the LBO market only experienced one wave.[580] As pointed out by De Maeseneire and Brinkhuis (2011), "*[A]fter years of enormous growth, at present the European LBO market is in any aspect bigger than ever but since the second half of 2007 declining.*" As the capital structure of buyouts consists of high proportion of debt, the global financial crisis triggered by the deep plunge in the value of US sub-prime mortgages affected the players in the LBO market.

Empirically, a substantial body of work based on LBOs from the 1980s concludes that leveraged transactions create value. Specifically, those studies have documented (1) gains in operating performance [e.g., Kaplan (1989b), Smith (1990), and Renneboog and Simons (2005)]; (2) gains in value from pre-buyout to a later change in ownership and restructuring [e.g., Kaplan (1989c), Kaplan (1994), and Andrade and Kaplan (1998)]; or (3) a relationship between premiums paid in buyouts and proxies for sources of the value gain [e.g., Kaplan (1989a), Lehn and Poulsen (1989), Marais, Schipper, and Smith (1989), and Lee, Rosenstein, Ragan, and Davidson (1992)].[581] The authors explain these gains based on the following theories: (i) benefits of tax shields; (ii) disciplining effects of leverage; and (iii) better governance mechanisms.

According to Guo et al. (2011) several features "*... have changed in the more recent wave of buyouts including potential motivations for transactions, transaction structures, characteristics of target firms, and characteristics of the financial sponsors.*" For a sample of 192 buyouts completed between 1990 and 2006, they conclude that cash flow performance is positively related (1) to the increase of leverage as a result of the buyout – consistent with the theories of the benefits of debt; (2) to the replacement of the CEO by the private equity sponsor, before or at the time of the LBO; and (3) to the existence of more than one private equity sponsor involved (the so-called 'club deal' transaction). Based on a sample of 180 LBOs completed between 1997 and 2007, Demiroglu and

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world." As pointed out by Kaplan and Stromberg (2009), the influx of capital from these vehicles was so extraordinary that the amount of capital committed to private equity in 2006 and 2007 reached record levels, surpassing the leverage buyout wave of the late 1980s.

[580] According to the World Economic Forum Private Equity Report (2008), the LBO activity has increased greatly over the years. While the total value of firms acquired through LBOs between 1970 and 2007 has been estimated at about $3.6 trillion, $2.7 trillion of these transactions took place between 2001 and 2007.

[581] All documented statistically significant positive excess returns to pre-buyout stockholders of 13% or more.

James (2010) find that (1) the frequency of reputable private equity groups (PEGs) in LBO transactions is negatively related to credit risk spreads; (2) buyouts of high reputation PEGs are financed with less traditional debt; and (3) leverage and maturity are consistent with the hypothesis that the reputation of the PEG affect lenders' perception of the underlying risk of the transaction. Similarly, De Maeseneire and Brinkhuis (2011) show that "*... the reputation of private equity sponsor involved in the buyout is positively related to LBO leverage.*"

LBOs in Continental Europe, United Kingdom, and United States

According to Renneboog and Simons (2005) both the number of deals and the value of LBO activity in the Continental European market are lagging that of the UK for the following reasons: (1) the European financial structure to undertake public-to-privates is different from that in the U.K.; (2) cultural aspects may also play an important role in the functioning and sophistication of European financial markets; and (3) the legal and fiscal regulation in Europe is traditionally not as favorable as in the U.K. and U.S.[582]

Research on LBOs based on U.S. transactions cannot be entirely extrapolated to U.K. and Continental Europe. First, the nature of debt financing differs substantially between U.S. and those of U.K./European deals. Second, tax issues are different in U.S. and U.K. – e.g., while they represent an important source of wealth gains in U.S. transactions, in U.K. taxes cannot play such large role because dividends are untaxed. Third, U.S. market for corporate control is more effective than that of U.K. and Continental Europe. Fourth, the buyout market in the U.K. and Continental Europe has been more closed than those in the U.S. Finally, regulation and organization of market for corporate control in U.K. and Continental European markets is completely different than the U.S. ones.[583]

[582] See Renneboog and Simons (2005) for further discussion of legal and fiscal regulation in Continental Europe.

[583] For a interesting analysis of the market developments for buyouts in the U.K. and continental Europe see Wright et al. (2006).

Annex 5: Summary of Relevant Literature on Structured Finance

	Theoretical Elements of Structured Finance Transactions							
	Operational and Informational Efficiency	Asymmetric Information	Capital Structure	Tax, Legal and Regulatory Issues	Agency Problem	Motivations: Financial Ratios, Source of Liquidity, High Level of Leverage	Motivations: Funding Costs, Diversification of Funding Sources, Financial Flexibility	Motivations: Risk Management, Capital Arbitrage, Tax Shields/Savings
Structured Finance	Davis (2005)	Diamond (1993)	Davis (2005)	Tavakoli (2008)		Davis (2005)	Akbiyikli et al. (2006)	Akbiyikli et al. (2006)
	Fabozzi et al. (2006)	Fabozzi et al. (2006)				Lancaster et al. (2008)	Caselli and Gatti (2005)	Caselli and Gatti (2005)
	Fender and Mitchell (2005)	Fender and Mitchell (2005)				Leland (2007)	Davis (2005)	Davis (2005)
	Jobst (2007)	Gordon and Pennacchi (1990)				Tavakoli (2008)	Jobst (2007)	Fink (2000)
	Lancaster et al. (2008)	Winton (1995)					Lancaster et al. (2008)	Jones (2000)
	Rajan and McDermott (2007)						Tavakoli (2008)	Lancaster et al. (2008)
								Tavakoli (2008)
Securitization	Berger and Udell (1993)	Keys et al. (2010)	Hill (1996)	Ambrose et al. (2005)	Keys et al. (2010)	Cardone-Riportella et al. (2010)	Carow et al. (1999)	Cardone-Riportella et al. (2010)
	Bolton et al. (2010)	Ambrose et al. (2005)	Jobst (2006a)	Berger and Udell (1993)	Alles (2001)	DeMarzo (2005)	Davidson et al. (2003)	Cumming (1987)
	Fabozzi et al. (2006)	Boot and Thakor (1993)	Shyam-Sunder and Myers (1999)	Berger et al. (1995)	Benveniste and Berger (1987)	Estrella (2002)	Fabozzi and Kothari (2007)	Davidson et al. (2003)
	Gaur et al. (2003)	Calem and LaCour-Little (2004)		Calomiris and Mason (2004)	Calomiris (2009)	Fabozzi and Kothari (2007)	Fabozzi et al. (2006)	Fabozzi (2005)
	Hill (1996)	Calomiris (2009)		Cardone-Riportella et al. (2010)	Criado and Rixtel (2008)	Fabozzi et al. (2006)	Goldberg and Rogers (1988)	Fabozzi and Kothari (2007)
	Lancaster et al. (2008)	Criado and Rixtel (2008)		Carlstrom and Samolyk (1995)	Fabozzi and Kothari (2007)	Flanery (1989)	Jost (2006a)	Fabozzi et al. (2006)
	Oldfield (2000)	DeMarzo (2005)		Cumming (1987)	Gorton (2009)	Goldberg and Rogers (1988)	Krebsz (2011)	Flannery (1989)
	Thomas (2001)	DeMarzo and Duffie (1999)		Davidson et al. (2003)	Hill (1996)	Goldberg et al. (1988)	Lupica (1998)	Goldberg and Rogers (1988)
		Flannery (1994)		Donahoo and Shaffer (1991)	Hull (2009)	Jobst (2006a)	Lupica (2009)	Goldberg et al. (1988)
		Fons (2008)		Duffie and Rahi (1995)	James (1988)	Krebsz (2011)	Roever and Fabozzi (2003)	Hess and Smith (1988)
		Glaeser and Kallal (1997)		Fabozzi et al. (2006)	Jobst (2006a)	Loutskina and Strahan (2009)		Hill (1996)
		Gorton (2009)		Hill (1996)	Jobst (2009)	Lupica (1998)		Jobst (2006a)
		Greenbaum and Thakor (1987)		Jagtiani et al. (1995)	Krebsz (2011)	Roever and Fabozzi (2003)		Jones (2000)
		Hill (1996)		Jones (2000)	Riddough (1997)			Krebsz (2011)
		Hull (2009)		Krebsz (2011)	Shin (2009)			Lupica (1998)
		Iacobucci and Winter (2005)		Lupica (1998)	Tavaloki (2008)			Lupica (2009)
		Jobst (2009)			Titman and Tsyplakov (2010)			Murray (2005)
		Krebsz (2011)						Pavel (1986)
		Lupica (2009)						Pavel and Phillis (1987)
		Pais (2009)						Penacchi (1988)
		Riddiough (1997)						Rosenthal and Ocampo (1988)
Project Finance		Esty (1999)	Brealey et al. (1996)	Fabozzi et al. (2006)	An and Cheung (2010)	Chemmanur and John (1996)	Bonetti et al. (2010)	Brealey, Cooper, and Habib (1996)
		Esty (2003)	Chemmanur and John (1996)		Berkovitch and Kim (1990)	Esty (2002a)	Chemmanur and John (1996)	Chemmanur and John (1996)
		Esty (2004a)	Esty (2002a)		Brealey, Cooper, and Habib (1996)	Fabozzi et al. (2006)	Esty (1999)	Corielli et al. (2010)
		Esty (2004b)	Esty (2003)		Esty (1999)	Gatti (2005)	Fabozzi et al. (2006)	Esty (1999)
		Kensinger and Martin (1988)	Esty (2004b)		Esty (2003)	Gatti (2008)	Gatti (2005)	Esty (2003)
		Shah and Thakor (1987)	Finnerty (2007)		Esty (2004a)	John and John (1991)	Gatti (2008)	Esty (2004a)
			John and John (1991)		Esty (2004b)	Nevitt and Fabozzi (2001)	John and John (1991)	Esty (2004b)
			Kensinger and Martin (1988)		Gatti (2008)	Shah and Thakor (1987)	Kleimeier and Megginson (2000)	Gatti (2008)
			Shah and Thakor (1987)		John and John (1991)	Vaaler, James, and Aguilera (2008)	Nevitt and Fabozzi (2001)	John and John (1991)
			Vaaler, James, and Aguilera (2008)				Shah and Thakor (1987)	

	Theoretical Elements of Structured Finance Transactions							
	Operational and Informational Efficiency	Asymmetric Information	Capital Structure	Tax, Legal and Regulatory Issues	Agency Problem	Motivations: Financial Ratios, Source of Liquidity, High Level of Leverage	Motivations: Funding Costs, Diversification of Funding Sources, Financial Flexibility	Motivations: Risk Management, Capital Arbitrage, Tax Shields/Savings
Structured Leasing				Lowellen, Long, and McConnell (1976) Myers, Dill, and Bautista (1976)	Altamuro (2006)	Altamuro (2006) Beattie et al. (2000) Caselli (2005) Fabozzi et al. (2006) Fowkes (2000) Krishnan and Moyer (1994) Sandler (2000) Weidner (2000)	Altamuro (2006) Beattie et al. (2000) Caselli (2005) Eisfeldt and Rampini (2009) Fabozzi et al. (2006) Fowkes (2000) Krishnan and Moyer (1994) Sandler (2000)	Altamuro (2006) Beattie et al. (2000) Caselli (2005) Fabozzi et al. (2006) Fowkes (2000) Lowellen, Long, and McConnell (1976) Myers, Dill, and Bautista (1976) Sandler (2000)
Leveraged Buy-Out	Kaplan and Strömberg (2009) Lichtenberg and Siegel (1990) Weston et al. (2001)	Cumming and Zambelli (2010) Harlow and Howe (1993) Kaestner and Liu (1996) Kaplan and Strömberg (2009) Lowenstein (1985) Schadler and Karns (1990) Weston et al. (2011)	Axelson et al. (2007) De Maeseneire and Brinkhuis (2011) Demiroglu and James (2007) Roden and Lewellen (1995)	Kaplan and Strömberg (2009)	Acharya and Kehoe (2008) Admati, Pleiderer, and Zechner (1994) Andres et al. (2007) Carow and Roden (1997) Cotter and Peck (2001) DeAngelo, DeAngelo, and Rice (1984) Gertner and Kaplan (1996) Guo et al. (2011) Jensen (1989) Kaplan (1989a) Kaplan (1989b) Kaplan and Strömberg (2009) Maug (1998) Nikoskelainen and Wright (2007) Opler and Titman (1993) Renneboog and Simons (2005) Tirole (2006) Weston et al. (2001)			Frankfurter and Gunay (1992) Guo et al. (2011) Kaplan (1989a) Kaplan and Strömberg (2009) Lowenstein (1985) Marais, Schipper, and Smith (1989) Renneboog and Simons (2005) Weston et al. (2001)

Annex 6: Structured Finance and Special Purpose Vehicles

Gorton and Souleles (2005) define a special purpose vehicle (SPV or SPE) as "*... a legal entity created by a firm (known as sponsor or originator) by transferring assets to the SPV, to carry out some specific purpose or circumscribed activity, or a series of such transactions. SPVs have no purpose other than the transaction(s) for which they were created, and they can make no substantive decisions; the rules governing them are set down in advance and carefully circumscribe their activities. Indeed, no one works at SPV and it has no physical location.*" [584] They can be either a trust or a company, and are used for a variety of purposes, including structured risk management solutions. SPVs can be either onshore or offshore and are powerful structured finance tools.

It is possible to identify the following common characteristics of off-balance sheet SPVs: (1) they are sub-capitalized (high financial leverage); (2) they have no management or employees, thus their administrative functions are performed by a trustee; (3) their assets are serviced by means of a servicing arrangement; and (4) they are structured so that there cannot be an event of default which would through the SPV into bankruptcy. This idea is presented by Gorton and Souleles (2005), who argue that one of the "*... key source of value to using SPVs is that they help to reduce bankruptcy costs.*" Structured finance transactions are means of off-balance sheet financing usually involving transferring assets to SPVs, thus reducing the amount of assets subject to bankruptcy costs. Hence, off-balance sheet financing is most advantageous for sponsors that face higher bankruptcy costs.[585] However, there are costs related to the off-balance sheet debt financing, namely; (1) fixed costs of setting up the SPV; and (2) no tax advantage (interest tax shields) of off-balance sheet debt to the SPV.

As referred by Tavakoli (2008), "*[B]ecause of their normally off-balance-sheet, bankruptcy-remote, and private nature, SPEs can be used for both legitimate and illegitimate uses.*" The main objective of the originator is meeting the requirements for off-balance sheet treatment of the assets; i.e., for bankruptcy and accounting purposes the structure should be considered as a sale and not as a loan. Additionally, the structure

[584] See Gorton and Souleles (2005) for further discussion of the background of SPVs, with a particular focus on legal, accounting, bankruptcy, taxable and credit enhancement issues.
[585] This idea is corroborated by Mills and Newberry (2005) and Gorton and Souleles (2005).

should be classified as a debt financing for tax purposes – the originator will want to ensure that the sale of assets to the SPV does not constitute a taxable event. The two main objectives from the perspective of the sponsor are: (i) SPE to pay zero tax on payments flowing in and flowing out; and (ii) avoid corporate tax and the venue of the SPE and the deal sponsor.

It is important to notice that the structured solution in terms of bankruptcy and tax treatment varies by venues. For example:

1. Venue such as Cayman Islands, with no tax treaties in place with most jurisdictions: there is no mechanism for reclaiming withholding tax (if any) on the underlying asset income from the country of origination. In this case, the SPE will purchase assets that are not subject to withholding at the country of the assets' origination so that investors will not suffer a reduced return.
2. Venue with tax treaties in place – assets subject to withholding tax may specifically be chosen so the withholding tax can be reclaimed.

In Europe, it is also an objective to avoid value-added tax (VAT) and stamp duties. The last goal is to have zero tax leakage, if possible. Venues such as the Caymans, Jersey, and Guernsey offer this advantage, but may not enjoy ready investor acceptability. Other venues such as the Netherlands, Luxemburg, and Ireland also offer several tax advantages.[586] There is (1) no withholding tax on note interest; (2) no stamp duty; (3) no withholding tax on deposits; and (4) a very small VAT in servicing and administration for the SPV.

SPEs can be set up also onshore in certain venues. For example, in the German Market a *Gesellschaft mit beschränkter Haftung* (GmgH) corporate structure is sometimes employed. In Portugal, legislation permits the use of two alternative arrangements for a securitization transaction: firstly, the Credit Securitization Fund or Fundo de Titularização de Créditos ("FTC"), and secondly, the Credit Securitization Company or Sociedade de Titularização de Créditos ("STC"). While, in the first alternative, a non-Portuguese special purpose vehicle ("SPV") has been included in all FTC

[586] The choice between venues take into account other considerations such as documentation needed, setup costs and setup time. The Netherlands usually takes several weeks longer to provide tax rulings for SPEs compared to Ireland and Luxemburg. For example, United Kingdom-based deals arrangers might prefer to deal with Ireland, since Ireland uses English law-based system.

securitizations, in the second alternative the STC – a Portuguese company – acquires certain types of receivables and issues directly securitization bonds.

Focusing on securitization, Lancaster et al. (2008) present Structured Investment Vehicle (SIV), Structured Lending Vehicle (SLV), and Credit Derivative Product Companies (CDPC) as types of Structured Finance Operating Companies (SFOC). According to Moody's (2005) "*[S]tructured Financial Operating Companies (SFOCs) are companies that depend upon detailed, pre-determined parameters to define and restrict their business activities and operations. Moody's ratings issued on SFOCs rely heavily upon these parameters and generally apply to the issuer's debt programs rather than to specific debt issues.*" An SIV is a vehicle that purchases securities (selected by the SIV manager), holds them and usually issue two types of securities – senior notes and capital notes – to fund the acquisition of the asset pool.[587] A SLV "*... purchase securities and then enters into a repurchase agreement or repo (as the asset buyer), total return swap (TRS) or funding agreement.*" Again, the primary purpose of SLVs is to provide leveraged returns for clients. Finally, CDPC sells synthetic credit protection on single company names or a portfolio of companies as well as structured assets. It issues equity and debt classes and then takes synthetic credit exposure [see, e.g., Lancaster et al. (2008)].

[587] Lancaster et al. (2008) argue that "*[I]s primary purpose is the creation of leveraged returns for the capital note (subordinated) investors by way of spread arbitrage between the return on assets and the cost of funding.*"

Annex 7: Regression Analyses of the Determinants of Credit Spreads: Models Grouped by Variables

Dependent variable:	[1a]	[1b]	[1c]	[2a]	[2b]	[2c]	[3a]	[3b]	[3c]	[4a]	[4b]	[4c]	[5a]	[6b]	[7c]
Credit spread (bps)	All PF Loans	All AS Bonds	All CB	PF Loans with rating	AS Bonds with rating	CB with rating	PF Loans with credit accessibility	AS Bonds with credit accessibility	CB with rating and credit accessibility	PF Loans with management fee	AS Bonds with management fee	CB with management fee	PF Loans with upfront fee	AS with rating, collateral, fixed rate and callable	CB with rating, credit accessibility, fixed rate and callable
Independent variables:															
Intercept	257.66 **	113.44 *	81.57 **	103.66	13.27	-139.35 **	242.39 **	275.34 **	-242.27 **	123.38 **	-257.06	10.45	89.13 **	22.34	-254.90 **
	(9.43)	(2.37)	(7.78)	(1.08)	(0.31)	(-14.39)	(7.21)	(3.25)	(-24.47)	(3.60)	(-0.91)	(0.59)	(3.18)	(0.60)	(-24.60)
Log transaction size	-19.52 **	-6.75	-8.80 **	16.81	3.74	0.75	-21.62 **	-10.95	11.10 **	-13.00	49.66	-11.17 **	0.30	2.76	13.34 **
	(-4.93)	(-1.52)	(-6.43)	(1.13)	(0.92)	(0.58)	(-4.46)	(-1.09)	(9.56)	(-1.97)	(1.18)	(-4.67)	(0.06)	(0.71)	(11.45)
Log loan to value	4.37 *	-40.91 **		10.44	0.79		7.35 **	-47.65 **		1.33	39.33		-0.08		
	(2.04)	(-5.48)		(1.32)	(0.10)		(2.79)	(-4.28)		(0.27)	(1.72)		(-0.02)		
Maturity	0.51	-0.72	-1.12 **	-0.59	-0.36	1.00 **	0.25	-0.34	1.30 **	0.75	0.84	3.63 **	0.83	0.16	0.26
	(1.67)	(-1.52)	(-3.87)	(-0.69)	(-0.67)	(4.60)	(0.66)	(-0.49)	(5.62)	(0.99)	(0.30)	(7.42)	(1.77)	(0.26)	(0.97)
Number of tranches	-1.02	-3.08	19.62 **	7.68	2.39	23.97 **	-3.62	-18.25 **	28.39 **	12.02 **	-6.37	10.07	2.08	1.37	25.87 **
	(-0.56)	(-0.95)	(36.87)	(1.32)	(0.86)	(9.10)	(-1.53)	(-3.08)	(9.46)	(2.88)	(-0.60)	(1.87)	(0.68)	(0.49)	(8.53)
Number of banks	1.42 **	-9.36 **	-1.63 **	0.32	-8.24 *	-1.65 **	1.94 **	-27.57 **	-1.55 **	1.15	-16.55	1.53 **	-0.98 *	-4.51	-2.05 **
	(3.87)	(-2.58)	(-3.47)	(0.26)	(-2.10)	(-4.35)	(3.50)	(-3.51)	(-2.90)	(1.32)	(-1.95)	(3.32)	(-2.05)	(-1.17)	(-3.80)
Country risk	7.78 **	-12.80	0.46	-13.97	-4.99	-2.04	9.88 **	-16.60	1.79	-7.21		10.40 **	2.89	-8.06	2.33
	(2.91)	(-1.04)	(0.29)	(-1.48)	(-0.74)	(-1.51)	(3.63)	(-1.10)	(1.31)	(-1.93)		(5.39)	(0.91)	(-1.21)	(1.71)
Currency risk	38.11 **	16.95	3.01	4.24	35.36	27.46 **	48.39 **	129.28 **	8.96 *	5.02	109.20	21.81 **	-6.78	27.21	1.25
	(2.88)	(0.79)	(0.60)	(0.19)	(1.96)	(6.64)	(2.65)	(2.93)	(2.04)	(0.21)	(1.83)	(4.44)	(-0.59)	(1.50)	(0.29)
U.K. borrowers	49.85 **	10.39	17.49 **		-10.10	6.43	58.30 **	-111.97 *	20.11 **	19.71		-2.37	39.27 **	-9.61	21.08 **
	(5.23)	(0.46)	(3.41)		(-0.53)	(1.58)	(4.25)	(-2.43)	(4.17)	(1.02)		(-0.38)	(3.92)	(-0.48)	(4.45)
Crisis	174.01 **	121.25 *	77.41 **	78.50	33.70	86.53 **	154.60 **		37.39 **	177.94 **		127.29 **	131.57 **	31.82	33.85 **
	(16.26)	(2.43)	(15.43)	(1.30)	(0.74)	(20.73)	(8.07)		(4.88)	(8.48)		(8.29)	(7.10)	(0.88)	(4.38)
Risk free rate	-0.16 **	0.12		-0.33 *	-0.03		-0.12 *								
	(-4.46)	(1.28)		(-2.24)	(-0.31)		(-2.24)								
Volatility	0.49	2.25 *	2.06 **		2.42 **	2.98 **	-0.53	6.37 **	1.63 **			1.86 **		2.73 **	1.53 **
	(1.64)	(2.13)	(9.91)		(2.81)	(17.88)	(-1.26)	(3.59)	(5.80)			(5.25)		(3.51)	(5.50)
EUSA5y-Libor3M	-0.46 **	-0.45 **	-0.02	-0.45	-0.52 **	-0.16 **	-0.40 **	-0.56 **	-0.05	-0.24 *	0.11	-0.09 **	-0.33 **	-0.50 **	-0.05
	(-7.41)	(-3.30)	(-0.60)	(-1.98)	(-4.35)	(-6.31)	(-4.31)	(-3.34)	(-1.39)	(-2.54)	(0.22)	(-2.98)	(-5.43)	(-4.42)	(-1.53)
Commercial		101.80 **	102.44 **		25.01	-17.93 **		131.04	-37.90 **		248.55 **	70.56 **		19.12	-47.60 **
		(3.28)	(17.20)		(0.99)	(-3.82)		(1.95)	(-6.36)		(2.84)	(8.81)		(0.69)	(-7.72)
Industrial	10.29	57.95	98.75 **	39.82	27.34	0.69	12.87	0.07	-12.07 *	12.55	-130.38	56.23 **	6.79	26.61	-24.22 **
	(1.14)	(1.56)	(19.30)	(24.51)	(0.99)	(0.17)	(1.08)	(0.00)	(-2.24)	(0.82)	(-1.79)	(10.05)	(0.38)	(0.89)	(-4.33)
Utilities	12.92	-16.49	20.66 **	16.60	-55.51	-39.93 **	13.71	30.30	-61.72 **	6.96	-10.24	2.58	-1.91	-65.45	-64.43 **
	(1.41)	(-0.42)	(4.17)	(0.57)	(-1.52)	(-8.59)	(1.20)	(0.40)	(-11.13)	(0.41)	(-0.17)	(0.27)	(-0.11)	(-1.72)	(-10.78)
Transportation	14.33	128.94	68.80 **		110.02 **	12.16	19.55		-0.60	-13.58	-71.68	16.65	-32.99	103.77 **	-9.19
	(1.39)	(1.88)	(5.94)		(3.64)	(1.47)	(1.37)		(-0.06)	(-0.75)	(-0.60)	(0.67)	(-1.68)	(3.03)	(-0.90)
Government	7.18		14.93	28.77		25.68 *	14.38		36.64 *	-5.82			-22.53		49.16 *
	(0.31)		(0.38)	(0.52)		(2.20)	(0.57)		(2.33)	(-0.09)			(-0.90)		(2.30)
Other			163.47 **			69.91 **			74.13 **			121.17 **			52.66 *
			(5.83)			(3.42)			(3.06)			(3.37)			(2.28)
Rating				7.37 **	27.44 **	29.06 **			30.80 **					27.24 **	29.19 **
				(2.99)	(8.65)	(43.11)			(38.84)					(10.42)	(37.00)
Credit accessibility							0.54 **	-0.66	0.82 **						0.83 **
							(3.39)	(-1.02)	(10.27)						(10.27)
Management fee										0.85 **	1.84	0.51 **			
										(3.17)	(1.35)	(2.74)			
Upfront fee													0.74 **		
													(8.57)		
Collateral														-47.37 **	
														(-2.68)	
Fixed rate														-26.93	29.24 **
														(-1.13)	(8.79)
Callable														-15.89	50.68 **
														(-1.08)	(9.54)
Number of observations	1,029	439	10,543	39	364	8,686	763	171	6,139	125	37	1,334	196	364	6,139
Adjusted R^2	0.51	0.19	0.21	0.67	0.46	0.43	0.49	0.24	0.53	0.70	0.37	0.40	0.66	0.48	0.55
F	90.00	6.55	238.24	6.60	11.45	261.21	77.32	6.03	232.48	18.56	2.75	32.82	25.76	11.57	223.82

Annex 8: Regression Analyses of the Determinants of Credit Spreads: Models Grouped by Issue Type

Dependent variable: Credit spread (bps)	[1a] All PF Loans	[2a] PF Loans with rating	[3a] PF Loans with credit accessibility	[4a] PF Loans with management fee	[5a] PF Loans with upfront fee	[1b] All AS Bonds	[2b] AS Bonds with rating	[3b] AS Bonds with credit accessibility	[4b] AS Bonds with management fee	[6b] AS with rating, collateral, fixed rate and callable	[1c] All CB	[2c] CB with rating	[3c] CB with rating and credit accessibility	[4c] CB with management fee	[7c] CB with rating, credit accessibility, fixed rate and callable
Independent variables:															
Intercept	257.66 **	103.66	242.39 **	123.38 **	89.13 **	113.44 *	13.27	275.34 **	-257.06	22.34	81.57 **	-139.35 **	-242.27 **	10.45	-254.90 **
	(9.43)	(1.08)	(7.21)	(3.60)	(3.18)	(2.37)	(0.31)	(3.25)	(-0.91)	(0.60)	(7.78)	(-14.39)	(-24.47)	(0.59)	(-24.60)
Log transaction size	-19.52 **	16.81	-21.62 **	-13.00	0.30	-6.75	3.74	-10.95	49.66	2.76	-8.80 **	0.75	11.10 **	-11.17 **	13.34 **
	(-4.93)	(1.13)	(-4.46)	(-1.97)	(0.06)	(-1.52)	(0.92)	(-1.09)	(1.18)	(0.71)	(-6.43)	(0.58)	(9.56)	(-4.67)	(11.45)
Log loan to value	4.37 *	10.44	7.35 **	1.33	-0.08	-40.91 **	0.79	-47.65 **	39.33						
	(2.04)	(1.32)	(2.79)	(0.27)	(-0.02)	(-5.48)	(0.10)	(-4.28)	(1.72)						
Maturity	0.51	-0.59	0.25	0.75	0.83	-0.72	-0.36	-0.34	0.84	0.16	-1.12 **	1.00 **	1.30 **	3.63 **	0.26
	(1.67)	(-0.69)	(0.66)	(0.99)	(1.77)	(-1.52)	(-0.67)	(-0.49)	(0.30)	(0.26)	(-3.87)	(4.60)	(5.62)	(7.42)	(0.97)
Number of tranches	-1.02	7.68	-3.62	12.02 **	2.08	-3.08	2.39	-18.25 **	-6.37	1.37	19.62 **	23.97 **	28.39 **	10.07	25.87 **
	(-0.56)	(1.32)	(-1.53)	(2.88)	(0.68)	(-0.95)	(0.86)	(-3.08)	(-0.60)	(0.49)	(36.87)	(9.10)	(9.46)	(1.87)	(8.53)
Number of banks	1.42 **	0.32	1.94 **	1.15	-0.98 *	-9.36 **	-8.24 *	-27.57 **	-16.55	-4.51	-1.63 **	-1.65 **	-1.55 **	1.53 **	-2.05 **
	(3.87)	(0.26)	(3.50)	(1.32)	(-2.05)	(-2.58)	(-2.10)	(-3.51)	(-1.95)	(-1.17)	(-3.47)	(-4.35)	(-2.90)	(3.32)	(-3.80)
Country risk	7.78 **	-13.97	9.88 **	-7.21	2.89	-12.80	-4.99	-16.60		-8.06	0.46	-2.04	1.79	10.40 **	2.33
	(2.91)	(-1.48)	(3.63)	(-1.93)	(0.91)	(-1.04)	(-0.74)	(-1.10)		(-1.21)	(0.29)	(-1.51)	(1.31)	(5.39)	(1.71)
Currency risk	38.11 **	4.24	48.39 **	5.02	-6.78	16.95	35.36	129.28 **	109.20	27.21	3.01	27.46 **	8.96 *	21.81 **	1.25
	(2.88)	(0.19)	(2.65)	(0.21)	(-0.59)	(0.79)	(1.96)	(2.93)	(1.83)	(1.50)	(0.60)	(6.64)	(2.04)	(4.44)	(0.29)
U.K. borrowers	49.85 **		58.30 **	19.71	39.27 **	10.39	-10.10	-111.97 *		-9.61	17.49 **	6.43	20.11 **	-2.37	21.08 **
	(5.23)		(4.25)	(1.02)	(3.92)	(0.46)	(-0.53)	(-2.43)		(-0.48)	(3.41)	(1.58)	(4.17)	(-0.38)	(4.45)
Crisis	174.01 **	78.50	154.60 **	177.94 **	131.57 **	121.25 *	33.70			31.82	77.41 **	86.53 **	37.39 **	127.29 **	33.85 **
	(16.26)	(1.30)	(8.07)	(8.48)	(7.10)	(2.43)	(0.74)			(0.88)	(15.43)	(20.73)	(4.88)	(8.29)	(4.38)
Risk free rate	-0.16 **	-0.33 *	-0.12 *			0.12	-0.03								
	(-4.46)	(-2.24)	(-2.24)			(1.28)	(-0.31)								
Volatility	0.49		-0.53			2.25 *	2.42 **	6.37 **		2.73 **	2.06 **	2.98 **	1.63 **	1.86 **	1.53 **
	(1.64)		(-1.26)			(2.13)	(2.81)	(3.59)		(3.51)	(9.91)	(17.88)	(5.80)	(5.25)	(5.50)
EUSA5y-Libor3M	-0.46 **	-0.45	-0.40 **	-0.24 *	-0.33 **	-0.45 **	-0.52 **	-0.56 **	0.11	-0.50 **	-0.02	-0.16 **	-0.05	-0.09 **	-0.05
	(-7.41)	(-1.98)	(-4.31)	(-2.54)	(-5.43)	(-3.30)	(-4.35)	(-3.34)	(0.22)	(-4.42)	(-0.60)	(-6.31)	(-1.39)	(-2.98)	(-1.53)
Commercial						101.80 **	25.01	131.04	248.55 **	19.12	102.44 **	-17.93 **	-37.90 **	70.56 **	-47.60 **
						(3.28)	(0.99)	(1.95)	(2.84)	(0.69)	(17.20)	(-3.82)	(-6.36)	(8.81)	(-7.72)
Industrial	10.29	39.82	12.87	12.55	6.79	57.95	27.34	0.07	-130.38	26.61	98.75 **	0.69	-12.07 *	56.23 **	-24.22 **
	(1.14)	(24.51)	(1.08)	(0.82)	(0.38)	(1.56)	(0.99)	(0.00)	(-1.79)	(0.89)	(19.30)	(0.17)	(-2.24)	(10.05)	(-4.33)
Utilities	12.92	16.60	13.71	6.96	-1.91	-16.49	-55.51	30.30	-10.24	-65.45	20.66 **	-39.93 **	-61.72 **	2.58	-64.43 **
	(1.41)	(0.57)	(1.20)	(0.41)	(-0.11)	(-0.42)	(-1.52)	(0.40)	(-0.17)	(-1.72)	(4.17)	(-8.59)	(-11.13)	(0.27)	(-10.78)
Transportation	14.33		19.55	-13.58	-32.99	128.94	110.02 **		-71.68	103.77 **	68.80 **	12.16	-0.60	16.65	-9.19
	(1.39)		(1.37)	(-0.75)	(-1.68)	(1.88)	(3.64)		(-0.60)	(3.03)	(5.94)	(1.47)	(-0.06)	(0.67)	(-0.90)
Government	7.18	28.77	14.38	-5.82	-22.53						14.93	25.68 *	36.64 *		49.16 *
	(0.31)	(0.52)	(0.57)	(-0.09)	(-0.90)						(0.38)	(2.20)	(2.33)		(2.30)
Other											163.47 **	69.91 **	74.13 **	121.17 **	52.66 *
											(5.83)	(3.42)	(3.06)	(3.37)	(2.28)
Rating		7.37 **					27.44 **			27.24 **		29.06 **	30.80 **		29.19 **
		(2.99)					(8.65)			(10.42)		(43.11)	(38.84)		(37.00)
Credit accessibility			0.54 **					-0.66					0.82 **		0.83 **
			(3.39)					(-1.02)					(10.27)		(10.27)
Management fee				0.85 **					1.84					0.51 **	
				(3.17)					(1.35)					(2.74)	
Upfront fee					0.74 **										
					(8.57)										
Collateral										-47.37 **					
										(-2.68)					
Fixed rate										-26.93					29.24 **
										(-1.13)					(8.79)
Callable										-15.89					50.68 **
										(-1.08)					(9.54)
Number of observations	1,029	39	763	125	196	439	364	171	37	364	10,543	8,686	6,139	1,334	6,139
Adjusted R^2	0.51	0.67	0.49	0.70	0.66	0.19	0.46	0.24	0.37	0.48	0.21	0.43	0.53	0.40	0.55
F	90.00	6.60	77.32	18.56	25.76	6.55	11.45	6.03	2.75	11.57	238.24	261.21	232.48	32.82	223.82

Annex 9: Independent Variables and their Expected Impact on the Credit Spread

We use the following microeconomic variables in this study: (i) *Log transaction size*; (ii) *Log loan to value*; (iii) *Maturity*; (iv) *Number of tranches*; (v) *Currency Risk*; (vi) *Number of banks*; (vii) *U.K. borrowers*; (viii) *Sector* (*Commercial*; *Industrial*; *Utilities*; *Financial Institutions*; *Transportation*; Government; *Other*); (ix) *Rating*; (x) *Management fee*; (xi) *Upfront fee*; (xii) *Collateral*; (xiii) *Fixed rate*; and (xiv) *Callable*. The following variables in our regression model intend to reflect the macroeconomic effects on the credit spread, namely: (i) *Country risk*; (ii) *Crisis*; (iii) *Risk free rate*; (iv) *Volatility*; (v) *EUSA5y-Libor3M*; and (vi) *Credit accessibility*. Next we intend to present a short definition of each variable and its expected impact on the credit spread.

Log transaction size

The log transaction size is the natural log of the global euro-equivalent amount of the transaction. A higher issue amount is generally believed to improve, ceteris paribus, secondary market liquidity. Larger issues are likely to be associated with less uncertainty, to be more liquid, and to have more public information available about them than smaller offerings. Hence, we would expect larger issues to have lower spreads. However, it is feasible to associate risk with loan size. Larger transactions might imply higher risk for lender since they constitute a larger share in its loan portfolio.

The reviewed empirical studies find positive as well as negative impacts on the spread with respect to the size of the loan. Scott and Smith (1986) find a positive coefficient and thus argue that size is a proxy for default risk. Contrary, Blackwell and Winters (1991) support a negative impact of size on the spread based in the argument that the cost of loan production lead to economies of scale and thus decreases in the spread. Similarly, Booth (1992) analyzes the impact of monitoring-related contract costs on bank loan spread and concludes that loan size has a negative impact on the spread. Recently, Sorge and Gadanecz (2008) find a negative coefficient on loan and bond size. Overall, the sign of the coefficient cannot be predicted with confidence for SDF.

Kleimeier and Megginson (2000) find a negative and significant relationship between loan spread and size for most syndicated credits, except for PF loans. Sorge and Gadanecz (2008) find that transaction size and credit spread are significantly, negatively related for PF loans, which might suggest that there are significant economies of scale for banks to arrange larger syndicated credit facilities. On the contrary, Blanc-Brude and Strande (2007) conclude that the tranche size is not a driver in PPPs. Thus, we expect a negative or insignificant sign for the coefficient.

Referring to AS, Maris and Segal (2002) study the determinants of credit spread on CMBS and find that tranche size influence negatively the CMBS credit spread. Similarly, Firla-Cuchra (2005), Vink and Thibeault (2008), and Buscaino et al. (2009) find a negative impact of transaction size on the spread. We expect larger AS issues to have lower spreads.

Log loan to value

The log loan to value is the natural log of the loan to value ratio. Typically, traditional loan transactions with higher loan to value ratios are generally seen as higher risk and, therefore, the loan will generally cost the borrower more. However, in an AS transaction the structure is layered so that each position benefits from the credit protection of all the positions subordinated to it. For example, each senior class (or tranche) has absolute priority in the cash flow over the more junior classes and are typically smaller than the senior ones. Thus, we expect a negative coefficient sign as AS tranches with a lower loan to value ratio (junior tranches) have a lower expected recovery rate and therefore require a higher return. Empirically, Vink and Thibeault (2008) find insignificant results for ABS, MBS, and CDOs.

Maturity

Time to maturity is measured in years. Loans or bonds with longer maturities tend to be more risky than loans or bonds with shorter maturities or average lives, because predictability of future cash flows weakens with horizon. Therefore, investors usually demand higher premium for longer term securities.

Empirical results show, for loans, a significant positive coefficient [e.g., Scott and Smith (1986)] but also an insignificant negative one [e.g., Booth (1992)]. Regarding CB, several authors [e.g., Jones et al. (1984), Sarig and Warga (1989), He et al. (2000), Duffie and Singleton (2001), and Sorge and Gadanecz (2008)] argue that lenders get a higher remuneration in investment grade bonds for being exposed to risk for a longer period of time. However, the literature has been more controversial regarding the term structure of credit spreads for non-investment grade bonds [see, among others, Sarig and Warga (1989), Fons (1987), Helwege and Turner (1999), and Sorge and Gadanecz (2008)].

Kleimeier and Megginson (2000) find that spread and maturity have significant negative relationship for PF loans. Gatti et al. (2007) find that despite maturities are negatively related to spreads, the coefficients are not statistically significant. Sorge and Gadanecz (2008) detect that whereas credit spreads for both investment-grade and speculative-grade bonds other than project finance are a positive linear function of maturity, in PF loans the term structure of credit spreads is 'hump-shaped'.[588] Thus, the variable expected sign for PF and CB transactions cannot be determined clearly from either the theoretical or the empirical literature.

Regarding AS, Vink and Thibeault (2008) find a significant negative relationship between spread and (i) CDOs with a maturity lower than 5 years (low maturity); and (ii) MBS with a maturity longer than 15 years (high maturity). However, the coefficients on ABS with low maturity and high maturity are insignificant.

<u>Number of tranches</u>

PF and AS issues are usually divided into one or more tranches. The same happens with several CB issues in our sample. For each transaction we computed manually the variable number of tranches. For PF and CB issues, it is feasible to associate risk with the number of tranches. Riskier transactions might imply a higher number of tranches since each investor is available to constitute a lower share in its portfolio and thus a positive coefficient is expected.

[588] According to Sorge and Gadanecz (2008), "*... when all other micro and macro risk factors are controlled for, a linear positive relationship between spread and maturity shows up very significant for both bonds and loans used for purposes other than project financing.*"

For AS bonds, the number of tranches allows us to analyze the impact of tranching on the credit spread. As referred by Vink and Thibeault (2008), "*[T]ranching could allow the issuer to take advantage of market factors such as greater investor sophistication and heterogeneous screening skills related to asymmetric information.*" Firla-Cuchra and Jenkinson (2006) find a significant and negative relationship between the number of tranches and the credit spread (launch spread). Thus, a negative coefficient of number of tranches is expected.

Number of banks

The bank involvement measured by the number of banks supporting the transaction can be used to approximate a deal's risk, since safer loans are easier to syndicate. The main reason why we collected this information is the need to analyze any differences in bank syndicates. However, it is expected to obtain a negative impact on the spread with respect to the number of banks involved for AS and CB, as it would indicate that a larger number is able to achieve, ceteris paribus, a better result or lower the spread.

Empirically, syndication is presented as playing a potential role in driving the credit spreads in PF loans. Esty and Megginson (2000, 2003) show a positive relationship between syndicate size (and concentration) and loan pricing, while Strahan (1999), Kleimeier and Megginson (2000), and Sorge and Gadanecz (2008) report that the presence of larger syndicates reduces credit spreads. Thus, the variable expected sign for PF loans cannot be determined clearly from the empirical literature.

Regarding AS transactions, Vink and Thibeault (2008) find that whereas credit spread and number of lead managers are significantly, negatively related for MBS, they have a insignificant relationship for ABS and CDOs.

Currency risk

As referred in sub-section 4.4.2, currency risk is defined as the risk that is run if the currency in which the loans is repaid differs from the borrower's home country currency. We should expect issues exposed to currency risk to have higher credit spreads than issues not exposed to currency risk. However, Kleimeier and Megginson

(2000) find a significantly negative relationship between currency risk dummy and spread for every syndicated loans category. This idea is corroborated by Gatti et al. (2007) who find that loans with cash flow or currency risk have lower spreads than those without. Contrary, Vink and Thibeault (2008) find that AS issues exposed to currency risk have higher spreads than other issues not exposed to currency risk.

U.K. borrowers

We included this variable to analyze the impact of given borrower/issuer belongs to U.K. or to Continental Europe. Whereas the U.K. financial market is more developed and deeper than the continental Europe market, we expect borrowers from U.K. to raise funds at a lower spread compared to borrowers from continental Europe.

Sector

We calculated dummies to identify seven borrower/issuer business groups that we might expect to have different risk characteristics and therefore to incur different pricing: *Commercial*; *Industrial*; *Utilities*; *Transportation*; *Government*; and *Other*. The control group includes banks and financial services.[589]

Sorge and Gadanecz (2008), based on a sample of PF loans, other loans, and bonds issued between 1993 and 2001, find that bonds and loans other than PF in the financial and transportation sectors carry a discount whereas high-tech borrowers are perceived as being more risky. They also conclude that issuers in the utility and state sectors enjoy a relatively cheaper cost of borrowing.

For PF loans, Gatti et al. (2007) find insignificant, positive or negative relationship between credit spread and business groups dummy depending on the sample used. Corielli et al. (2010) point out that industrial sectors does not influence the level of credit spread in PF transactions.

[589] Sector is a dummy variable divided into seven categories as proposed by Kleimeier and Megginson (2000).

Rating

Virtually all empirical studies on CB credit spread have found credit ratings to be one of the most important determinants of spreads. Several authors find a significantly positively relationship between credit rating and credit spread for CB issues.[590]

Consistently with Firla-Cuchra (2005) and Hu and Cantor (2006), Vink and Thibeault (2008) present credit rating as the most significant in determining credit spread at issue for AS bonds; i.e., the credit spread rises when rating worsen. Similar conclusions are presented by Buscaino et al. (2009).

Analyzing PF issues, Kleimeier and Megginson (2000) find that one unit increase in credit risk rating is associated with a significant increase in a PF loan's spread.

In short, a better rating should result in lower credit spreads. However, a word of caution is needed here, as it is important to notice that the rating scales are inverse scales, so it is expected that spread increases as the rating decreases. As we converted the rating into a number (see Table 4.8), the ratings are ranked and a better rating receives a lower number. Thus, the higher the number, the riskier the loan. This coding of the variable credit rating implies that it will have positive coefficient, since the higher the rating the higher the number coded for the credit rating variable and the higher the spread.

Management Fee

Credit spreads are not an entire measure of the cost of a loan or a bond, because borrowers also have to pay fees that are usually related to creditworthiness and performance. Commitment fees are typically charged by lenders in the syndications market and are paid annually on the balance of the undrawn portion of a PF loan. Management fees are periodic payments made by issuers to the underwriting banks. Variable management fee represents the fees that are periodically paid to the bank syndicate for PF loans and to the underwriting group of banks for bonds. Management

[590] See, e.g., Arvantis, Gregory, and Laurent (1999), Duffie and Singleton (1999), Elton et al. (2001), Collin-Dufresne, Goldstein, and Martin (2001), Huang and Huang (2003), Hull, Predescu, and White (2004), and Gabbi and Sironi (2005).

fees are higher for riskier borrowers because they are more likely to borrow and more likely to default.

Empirically, Blanc-Brude and Strange (2007) find that commitment fees are significantly and positively correlated with spreads.

Fixed rate

We collected information on whether the issue had a fixed rate or a floating rate. With fixed interest rate, the interests do not fluctuate and are typically protected to avoid the risk of rising interest rates. We expect borrowers to raise funds at a higher spread through fixed priced issues than through floating priced issues. For this reason, a positive sign is expected for a fixed rate issue.

Empirically, Sorge and Gadanecz (2008) find a significant discount in the pricing of floating rate bonds. They assert that this can reflect the insurance which fixed rate offers against future interest rate fluctuations.

Callable

Callable is a dummy variable equal to one if the bond has a call option and zero otherwise. A callable bond is a bond that can be redeemed by the issuer at some point before the bond reaches its date of maturity. The call price will usually exceed the par or issue price; i.e., usually there are substantial call premiums. Thus, a positive sign is expected for a callable bond as the issuer has an option, for which it pays in the form of a higher credit spread.

Upfront fee

A fee paid by a borrower to a bank (mandate bank) or a bank syndicate (lead arrangers) for making a loan. It includes fees to be paid to participating banks, also called participation fees.

Credit spreads and fees are usually complements or substitutes in syndicated loans; i.e., arrangers are usually ‘paid’ by spreads and fees. For example, Gatti et al. (2007) find that top arrangers are paid by higher fees even if the overall cost of the loan tranche is reduced by certification. Blanc-Brude and Strange (2007) find that upfront fees are significantly and positively correlated with spreads. We expect thus a positive sign for upfront fee.

Collateral

The markets for the securities issued through securitization are composed of three main classes. Securities backed by mortgages are called mortgage-backed securities (MBS), securities backed by debt obligations are called collateralized debt obligations (CDOs), and securities backed by consumer-backed products – e.g., car loans and consumer loans and credit cards – are called asset-backed securities (ABS). Collateral is a dummy variable taking the value of 1 if securities are backed by mortgages (i.e., if they are MBS) and 0 otherwise (e.g., if securities are backed by consumer-backed products).

The type of collateral in an AS transaction should determine the credit spread. Vink and Thibeault (2008) find that the average spreads are statistically and significantly lower for MBS than they are for ABS. We should thus expect a significantly negatively coefficient for collateral dummy variable.

Country risk

Country risk is approximated by Standard & Poor’s country rating; i.e., the S&P's country credit rating at close. The rating is converted as follows: AAA=1, AA+=2, and so on until D=22. Thus, this variable measures from 1 for the countries with the lowest risk to 22 for the countries of highest risk. A positive coefficient is expected since countries with a lower score number (highest quality) have lower country risk.

The reviewed empirical studies find a positive impact on the credit spread with respect to the country risk rank for PF loans. For example, Kleimeier and Megginson (2000) and Gatti et al. (2007) find that whenever employed, the country risk rank variable is significantly positive. Similarly, Corielli et al. (2010) find positive signs of the country risk rating. Regarding AS we do not find any empirical study that includes country risk as an regressor to test the impact of country credit risk on credit spread.

Crisis

Crisis is a dummy variable equal to one if the issue date or active date belongs to the crisis period and zero otherwise. We consider a pre-crisis period from January 1st, 2000 through to September 14th, 2008, and a crisis period from September 15th, through to December 31st, 2011. A positive coefficient is expected since the 2007/2008 financial crisis has resulted in a number of bank bailouts and business failures, a decline in consumer wealth, and a downturn in economic activity.

Risk free rate

We use as a proxy for the risk-free rate the three-month German Treasury bill at the time of the signing of the loan or issuing the bonds. Eichengreen and Mody (1998) and Kamin and Von Kleist (1999) find that the general level of interest rates is an important determinant of the pricing of loans and bonds. Scott and Smith (1986) find a positive impact for the risk free rate on the contract rate. In contrast, Blanc-Brude and Strange (2007), for a sample of EU and UK PPPs, find that risk-free rate variable proves to have no statistically significance on the pricing of PF tranches.

Volatility

None of the previous studies investigating pricing for loans and bonds include any volatility conditions controls, as we do. Volatility refers to the amount of uncertainty or risk associated with changes in a asset's value. A higher volatility means that a asset's value can potentially be spread out over a larger range of values; i.e., the price of the financial assets can change dramatically over a short time period in either direction. On the contrary, a lower volatility means that a asset's value does not fluctuate dramatically, but changes in value at a steady pace over a period of time. We use the Chicago Board Options Exchange (CBOE) Volatility Index (VIX) as a proxy for market volatility.[591] VIX reflects a market estimate of future volatility, based on the weighted average of the implied volatilities for a wide range of strikes.

We expect a positive relationship between volatility and credit spread as borrowers will require a higher return in the presence of higher volatility.

EUSA5y-Libor3M

The slope of the Euro swap curve (obtained as the difference between the five-year Euro swap rate and the 3-month Libor rate) is motivated by the following reasons: (i) it corrects for the fact that loans and bonds credit spread might be measured over base rates of different maturities; and (ii) it controls for varying inflation expectations, which might have different impact on pricing fixed *versus* floating rate debt.

For CB and other loans than PF, Sorge and Gadanecz (2008) find that a steeper US Treasury yield curve is associated with lower spreads. Hu and Cantor (2006) find that structured finance spreads are highly correlated with the slope of the swap curve.

Credit accessibility

Credit conditions might have a significant impact on the cost of funding. The variable credit accessibility tries to capture this effect. We use iTraxx Europe index as a proxy for credit conditions and therefore for the credit accessibility of borrowers/issuers to funding in the closing date of loans and bonds tranches.[592] iTraxx Europe is constructed on a set of rules with the overriding criterion being that of liquidity of the underlying Credit Default Swaps (CDS). Despite none of the previous studies include any credit conditions control, we expect borrowers to raise funds at a higher credit spread when the iTraxx Europe index rise and thus the credit accessibility is lower.

[591] The VIX Index is a key measure of market expectations of near-term volatility conveyed by S&P 500 stock index option prices. Since its introduction in 1993, VIX has been used as one of the most important barometers of investor sentiment and market volatility.

[592] The Markit iTraxx Europe index comprises 125 equally weighted credit default swaps on investment grade European corporate entities, distributed among 4 sub-indices: Financials (Senior & Subordinated), Non-Financials and HiVol. The composition of each Markit iTraxx index is determined by the Index Rules. Markit iTraxx indices roll every 6 months in March and September.